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Peace and Good Will Toward Men

RAPPROCHEMENT between Government and business is a most heartening development. Moods mean more than statistics. In a nation which has been drinking deep of the cup of bitterness and despair for five long years, emotional excesses are finally passing and calmer counsel is gaining a hearing. The state of mind which demanded action for the sake of action and bold experimentation regardless of risk is giving way to a spirit of growing caution. Not that experimentation has entirely failed, but rather that those who led in the blazing of new paths have learned the difference between theory and practice and are now ready to give an ear to business experience.

In accepting the olive branch extended by the Administration, business has both an opportunity and a responsibility. Its opportunity lies in allaying unnecessary fears and bolstering confidence, and, most important of all, devising constructive and practical plans for stimulating the revival of private enterprise. Its responsibility embraces a fuller appreciation of the Administration's continuing problem of providing relief for the idle and overcoming the spirit of unrest, animosity and vindictiveness that adversity has instilled into the unfortunate. To condemn blind radicalism is not to destroy it. The idle, and especially the new generation of youth now searching in vain for work, provide ready tinder for the demagogic spark. We want no Hitler in this country.

But that danger is waning rather than waxing. Faith in panaceas is passing. Discrimination is replacing generalization. The sins of the few are no longer attributed to the many. Business, labor and Government are beginning to recognize that recrimination must give way to collaboration. While organized labor has chosen continued strife in preference to the generous terms of truce offered by the great steel industry, its decision is out of keeping with the prevailing spirit of the time. It may hinder, but, with determined leadership at Washington, it can not prevent the growth of conciliation and concord in a nation weary of agitation and contention. Peace and good will toward men, so appropriate as the Christmas season approaches, promise to finish the task of surmounting the obstacles to business recovery.

G. L. LACHER,
Managing Editor, The Iron Age.

Pearlitic Alloy Steels For

THE improvements of processes in oil refineries and steam power plants in order to capitalize the benefits of higher operating temperatures and pressures have created a large demand for alloy steel tubing. The highly-alloyed stainless steels were the first special materials selected for high-temperature service because they had the unique distinction of exhibiting excellent high-temperature strength as well as corrosion and oxidation resistance. While the large initial costs of the stainless steels are justified in many cases, there are some applications for which low-priced pearlitic alloy steels, though less resistant to corrosion and oxidation, would be more economical. The authors herein discuss the properties of pearlitic alloy steels and show how such steels are admirably suited for applications that are too severe for carbon steel but for which the stainless steels would not be an economical choice. Thus it is shown that the pearlitic alloys will give dependable and long service at temperatures from 1000 to 1200 deg. F.

FOR practical purposes the pearlitic alloy steels for high-temperature service may be defined as steels containing small amounts of one or more of the special elements molybdenum, chrome, tungsten, vanadium, nickel and aluminum. The total amount of special elements seldom exceeds 6 per cent, and is only one-half of 1 per cent in the standard carbon-molybdenum type. Each of these low-alloy steels will offer certain corrosion and oxidation resistance, high-temperature mechanical properties, and stability governed by the individual chemical composition of the material. At one time it was supposed that all pearlitic steels would show substantially the same creep characteristics as plain carbon steel. This impression has since been corrected after it was demonstrated that many pearlitic alloy steels have higher creep strength than carbon steel and some have nearly as great resistance to creep as the 18-8 stainless steel at temperatures up to 1050 deg. F.

Carbon steel can be used successfully at temperatures up to 900 deg. F. Broadly speaking, the stainless

steels are capable of satisfying general service requirements up to possibly 1500 deg. F. The pearlitic alloy steels are intended for applications that are too severe for carbon steel but not sufficiently severe to necessitate the use of stainless steels. The pearlitic steels have a prospective working temperature of from 900 to 1200 deg. F. The commercial importance of these steels has prompted the authors to give them a fuller description than they have been accorded heretofore. Most of the data has been taken from researches completed recently on a selected group of steels that are now in regular use or are suited to specific applications in high-temperature service. Comparisons have been drawn against a conventional killed plain carbon steel, which is simply a pearlitic steel without alloying elements.

The chemical composition, heat treatment, hardness and grain size of five selected alloy tube steels are given in Table 1, together with similar data for a killed plain carbon steel that has been used for comparisons. The DM, MM9 and 4615 are steels developed or exploited by the Timken Steel & Tube Co. for various high-temperature applications, and the C-Mo and 4-6 Cr-Mo are steels made by that

company to conform with the analyses in Manufacturers' Standards No. 100 and No. 200 respectively.

All the steels investigated were made in the electric furnace to avoid unfair comparisons of dissimilar analyses when one steel might normally be produced in the electric furnace, another in the open-hearth furnace. The 4-6 Cr-Mo steel is logically a steel to be made in the electric furnace because of the relatively high chromium content, but the plain carbon and C-Mo types are usually open-hearth steels. The DM, MM9 and 4615 steels can be melted by either process, although the electric furnace grade is recommended for important high-temperature applications.

With the exception of the 4-6 Cr-Mo steel, which normally has a No. 7 grain size as determined in the carburizing test, the steels would be classified as coarse-grained materials of 4-5 grain size. The DM, 4-6 Cr-Mo, C-Mo, and carbon steels were fully annealed to obtain a stable structure of low hardness. The samples MM9 and 4615 were normalized and tempered to develop better high-temperature properties and good stability for continuous operation at temperatures up to 1000 deg. F. The hardness of all the steels is low enough to assure satisfactory manipulation of tubes by users.

Ductility Gains With Temperature Rise

The ultimate strength, yield strength and proportional limit determined in the short-time tensile tests at elevated temperatures may serve as the basis of tube design if the proper factor of safety is employed. Even in the cases when tubes are designed with the long-time properties in view, the yield strength in the short-time tensile test becomes a measure of the capacity of a material to sustain occasional overloads. Table 2 shows the short-time tensile properties of the pearlitic alloy steels selected for study. The general tendency is for the steels

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High-Temperature Service

By A. E. WHITE¹, C. L. CLARK² and R. L. WILSON³

to lose strength and gain in ductility as the temperature increases. The elongation value decreases somewhat in the neighborhood of 900 deg.

F. to 1000 deg. F., corresponding to the brittle range observed in hot impact tests on the same steels.

Aside from any usefulness that may be attached to the tensile properties as such, the tabulation demonstrates several other points of interest. It has been known for some time that the initial physical condition of a steel affects the high-temperature properties. As contrasted with annealing, the normalizing and tempering treatment is seen to give a high ratio of proportional limit to ultimate strength that persists until fairly high temperatures are reached. Beyond 1000 deg. F. the effects of preliminary heat treatment are not so noticeable.

Among the annealed steels are alloys of quite different chemical composition that show much the same properties at room temperature. This is often not recognized and has led to misunderstandings regarding the function of the alloying elements in the special steels. Elements can be added to a steel to retard creep or improve the corrosion or oxidation resistance of the alloy without making a significant change in the room temperature properties of the fully annealed steel.

It is also noteworthy that the DM and 4-6 Cr-Mo steels, which exhibit the best combination of short-time

tensile properties up to 1400 deg. F., are the only two steels on the list that transform at a temperature above 1400 deg. F. The carbon change-points of the other four steels fall between 1300 deg. F. and 1400 deg. F., so that heating to 1400 deg. F. has already started the transformation of these steels. This probably accounts in part for the disappearance of the proportional limit of the C-Mo, MM9 and carbon steels at 1400 deg. F.

The creep of the six steels was measured at temperatures ranging from 800 deg. F. to 1300 deg. F. The single-step method of loading was employed with not fewer than four different stresses applied to each steel at each temperature. The tests were conducted for periods ranging from 500 to 1600 hr., and the elongation due to creep was determined by means of an optical extensometer system sensitive to 2.8 millionths of an inch per inch on the standard tensile specimen.

While few if any creep tests have been conducted for very long periods of time, it is customary to report results in terms of the stresses required to produce creep at the rate of one per cent in 100,000 hr. and one per cent in 10,000 hr. as well as one per cent in 1000 hr. The practice is founded on the assumption that a creep rate of 0.01 per cent in 1000 hr.

and 0.10 per cent in 1000 hr. are equivalent to one per cent in 100,000 hr. and one per cent in 10,000 hr. respectively. This assumption appears justified,

especially for slow rates of creep, because the slopes of the time-elongation curves continue to decrease as the time of the test is prolonged. Errors in the creep strength corresponding to a fixed rate of creep would therefore be on the side of safety.

In Table 3 are listed the creep strengths of the steels at various temperatures for three different rates of creep. Large differences are apparent in the creep characteristics of some of the steels that compared closely in the short-time tensile tests. DM is the outstanding steel for high creep strength above 950 deg. F., while the MM9 steel has the highest creep strength at temperatures below 950 deg. F. The other alloy steels are intermediate between the carbon steel and DM or MM9 over most of the temperature range. Nevertheless, the creep strength of the carbon steel up to 900 deg. F. compares quite favorably with that of the low-alloy steels. The results on a few calorized specimens have been included, as the DM and C-Mo steels retain good strength at temperatures where oxidation becomes serious. The calorized surface of the specimens seemingly has no effect on the creep of the steel.

In considering the impact resistance of steels at elevated temperatures, it

TABLE 1
Compositions, Properties, and Treatments of Pearlitic Alloy Tube Steels for High-Temperature Service

Material	Chemical Composition								Heat Treatment (Deg. F.)	Brinell Hardness	Grain Size
	C	Mn	Si	Cr	Mo	Ni	S	P			
DM	0.07	0.42	0.72	1.24	0.54	—	0.015	0.014	Annealed at 1550 deg.	123	4 to 5
4-6 Cr-Mo	0.10	0.45	0.18	5.09	0.55	—	0.015	0.017	Annealed at 1550 deg.	128	7
C-Mo	0.16	0.47	0.23	—	0.42	—	0.015	0.016	Annealed at 1550 deg.	126	4 to 5
MM9	0.15	1.25	0.19	—	0.25	—	0.018	0.026	Normalized at 1725 deg. and tempered at 1200 deg.	140	4 to 5
4615	0.14	0.53	0.28	—	0.25	1.85	0.016	0.019	Normalized at 1725 deg. and tempered at 1200 deg.	149	5
Carbon	0.15	0.50	0.23	—	—	—	0.029	0.025	Annealed at 1550 deg.	126	4 to 5

TABLE 2—HIGH-TEMPERATURE TENSILE PROPERTIES OF PEARLITIC ALLOY TUBE STEELS

Steel	Temperature Deg. F.	Ultimate Strength	Yield Strength*	Proportional Limit	Elongation 2 In.	Reduction of Area
DM	85	66,500	35,200	24,000	36.5	72.7
	750	71,650	26,400	18,000	27.0	67.8
	1,000	57,750	24,900	15,000	25.5	73.3
	1,200	33,300	16,000	3,500	36.5	88.2
	1,400	13,800	7,000	1,500	72.5	98.4
4-6 Cr-Mo	85	66,600	26,300	19,000	39.0	80.5
	750	51,800	21,100	14,000	30.5	76.7
	1,000	44,500	17,300	7,500	28.5	73.5
	1,200	25,800	11,300	1,500	46.0	91.0
	1,400	13,300	7,300	1,500	65.9	95.9
C-Mo	85	64,100	32,500	25,000	37.0	62.7
	750	68,100	23,500	12,000	29.0	61.7
	1,000	50,500	22,800	8,100	32.5	77.7
	1,200	28,100	15,100	2,000	56.0	88.6
	1,400	11,700	5,900	0	83.0	89.0
MM9	85	72,100	51,300	45,000	36.0	71.9
	750	74,500	35,800	23,750	26.0	64.2
	1,000	52,300	30,900	15,600	32.0	82.0
	1,200	30,000	17,400	4,000	53.0	90.0
	1,400	13,400	6,100	0	80.5	86.5
4615	85	72,500	52,500	47,500	37.5	70.0
	750	65,300	32,800	24,500	29.0	69.6
	1,000	43,500	25,500	8,000	25.0	81.5
	1,200	25,000	12,000	4,300	59.0	79.9
	1,400	11,700	5,900	0	83.0	89.0
Carbon	85	62,500	42,000	34,500	36.0	67.5
	750	58,000	24,700	13,100	34.5	67.0
	1,000	36,500	20,100	8,750	42.5	76.9
	1,200	20,000	10,200	1,875	54.5	89.1
	1,400	9,000	3,750	0	70.0	76.9

*Yield strength values are for two-tenths per cent of permanent set.

may be desirable to know the effect of heating time on the hot shock value of the materials. For this purpose the hot impact test can be regarded as a simple mechanical test by ignoring the probable changes in the stability of the materials. The Charpy impact values of the selected steels at

various temperatures are given in Table 4. Specimens were broken after being held at heat one hour and 1000 hr. to accentuate the effect of soaking time on the shock value.

The steels showed good impact strength in all cases, with the lowest values in the temperature range 900

deg. F. to 1000 deg. F. However, even these minimum values would seem to provide adequate protection against damage by impact. Although the test specimens were not under stress during the heating, it is believed that stress is more likely to influence the shock resistance of the steel after it has cooled to atmospheric temperature than while it is hot. This feature of high temperature impact testing can now be considered.

To learn whether these steels are stable when subjected to stress for long periods of time at elevated temperatures, a number of tests including tensile, Izod impact and metallographic determinations were made on the creep specimens after the creep tests were completed. As four different creep specimens were taken for each steel at each temperature two of them were available for short-time tensile tests at room temperature, while the remaining two were used for Izod impact tests and microscopic examination of the structure. Identical tests were made on the steels in the original heat-treated condition so that changes in the physical properties could be traced in the comparisons. Space will not permit a complete tabulation of the tensile test results, but the data can be summarized briefly as follows: None of the steels showed an appreciable change in tensile properties at temperatures up to 1000 deg. F. At 1200 deg. F., which was the highest temperature reached in the tests, the DM and 4-6 Cr-Mo steels were still practically unchanged. Between 1000 deg. F. and 1200 deg. F. there is progressive softening of the MM9, C-Mo and carbon steels, characterized by gradual loss in strength and gain in ductile properties. The 4615 steel was not tested above 1000 deg. F.

The results of the Izod impact tests are given in Table 5. In making the Izod specimens it was necessary to finish them somewhat smaller than the standard size because they had to be machined from the creep specimens, which were 0.505 in. in diameter. However, the same specimen size was used in tests on the original materials in order to keep the results comparative. It should be noted that these tests resemble the tests made to determine the susceptibility of steels to temper-embrittlement, except that here stresses are acting on the steels during the heating at high temperatures.

The cold shock resistances of the DM, MM9 and 4-6 Cr-Mo steels are almost unaffected by temperature and stress for quite long periods at temperatures as high as 1200 deg. F.; C-Mo steel first loses shock value at

TABLE 3—CREEP STRENGTHS OF PEARLITIC ALLOY TUBE STEELS AT DIFFERENT TEMPERATURES

Steel	Temperature, Deg. F.	Stress for Designated Rate of Creep		
		One Per Cent per 100,000 Hr.	One Per Cent per 10,000 Hr.	One Per Cent per 1,000 Hr.
DM	800	20,000	29,000	42,500
DM	1,000	15,000	24,000	37,500
DM	1,100	4,300	6,800	10,800
DM	1,200	1,950	3,950	8,100
DM (Calorized)	1,300	700	1,800	3,900
4-6 Cr-Mo	800	14,250	22,000	34,000
4-6 Cr-Mo	1,000	7,000	10,250	12,900
4-6 Cr-Mo	1,200	900	2,500	5,250
C-Mo	800	15,500	26,000	44,500
C-Mo	1,000	10,700	17,800	29,200
C-Mo (Calorized)	1,100	2,700	7,000	15,000
C-Mo	1,200	480	2,000	4,050
C-Mo (Calorized)	1,300	210	840	1,900
MM9	800	27,000	38,500	55,000
MM9	900	21,000	31,500	46,500
MM9	1,000	7,400	14,000	18,250
MM9	1,200	460	1,075	2,500
4615	1,000	4,600	7,700	13,000
Carbon	800	18,500	26,800	38,500
Carbon	900	12,800	16,900	22,100
Carbon	1,000	2,700	5,750	12,100
Carbon	1,100	840	1,800	3,850
Carbon	1,200	290	620	1,300

800 deg. F. to 1000 deg. F., then gains toughness impressively at 1200 deg. F.; and carbon steel, after showing good cold shock resistance up to 1100 deg. F. under stress, begins to lose toughness at 1200 deg. F. Although plain carbon steel is ordinarily considered to be free from temper-embrittlement, examples are known of a partial loss of cold impact resistance after the material has undergone extreme spheroidization in service.

Stress Has Little Effect on Structure

For the metallographic examination of the steels, specimens were taken from the centers of the gage sections of the test-pieces used in the creep determinations. The structure of each steel was examined in the original condition and after two different stresses at each temperature in the creep tests. A magnification of 100 diameters was used to reveal the general features of the structures and 1000 diameters was resorted to in order to bring out the details of the structures. The annealed 4-6 Cr-Mo steel was spheroidized to start with and showed no change in structure even at 1200 deg. F. under a stress of 4000 lb. per sq. in. The other steels, which were not spheroidized originally, exhibited no apparent change at 1000 deg. F., but at 1200 deg. F. numerous very small carbide particles had been precipitated in the ferrite, and the carbides in the pearlite had begun to coalesce. The carbon steel seemed to have spheroidized more quickly than the DM, C-Mo and MM9 steels.

It thus seems that all these pearlitic alloy steels are quite stable in mechanical properties and structure up to 1000 deg. F. At 1200 deg. F. there are signs of structural changes except in the 4-6 Cr-Mo steel; the DM and 4-6 Cr-Mo steels are the only ones that maintain the same mechanical properties at room temperature after a period of heating under stress at 1200 deg.

New steels can seldom be introduced for applications in which corrosion may be encountered unless they are manifestly resistant to attack in certain accelerated corrosion tests. No one test is unanimously accepted as the criterion for judging the utility of materials, but almost everyone admits the necessity of having a few data from accelerated corrosion tests to encourage the trial of a new alloy commercially. Once a steel has been tried and proved on an experimental basis under actual service conditions, the results of the service tests properly supersede the data in the less dependable accelerated corrosion tests.

TABLE 4—CHARPY IMPACT RESISTANCE OF PEARLITIC ALLOY TUBE STEELS AT DIFFERENT TEMPERATURES

		(Each Value is an Average of Three Tests)							
Material	Time Held at Temperature	Temperature of Test in Deg. F.							
		80	500	600	750	900	1,000	1,100	1,200
DM	1 hr.	68.0	63.3	65.5	64.0	38.3	34.8	38.6	60.0
	1,000 hr.	...	69.7	68.8	57.6	45.8	43.3	41.7	...
4-6 Cr-Mo	1 hr.	81.3	68.7	72.5	75.0	64.5	58.7	54.3	53.7
	1,000 hr.	...	77.0	80.66	73.3	52.0	61.0	56.0	...
C-Mo	1 hr.	32.7	44.7	41.0	38.7	26.3	25.5	31.0	56.0
	1,000 hr.	...	44.3	46.5	35.0	26.7	30.0	38.0	...
MM9	1 hr.	59.7	63.3	56.7	51.7	38.7	34.0	53.7	67.3
	1,000 hr.	...	58.3	59.8	50.0	36.7	37.0	43.7	...
4615	1 hr.	61.7	59.5	62.0	48.5	32.3	24.7	55.3	70.3
	1,000 hr.	...	65.0	64.3	50.0	37.3	39.8	52.7	...
Carbon	1 hr.	40.7	45.3	48.7	36.3	29.0	30.3	39.3	59.0
	1,000 hr.	...	45.3	42.0	40.0	28.8	30.0	32.5	...

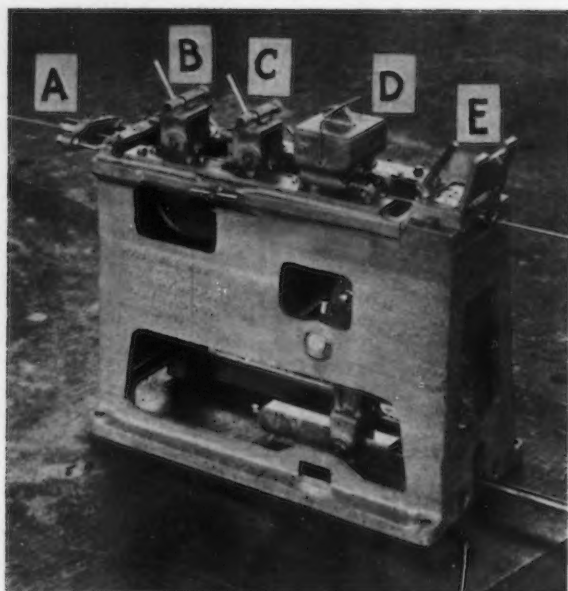
Among the group of pearlitic alloy steels being considered are several types that have passed the experimental stage and for which reliable service data are available. Tubing of the 4-6 Cr-Mo steel, for instance, has already been in commercial use about four years with a record of good performance in a large number of refineries processing various grades of crude oil. Tubes of the DM and C-Mo steels have likewise been used in refinery service nearly two years. On the basis of the service data it can be conservatively estimated that the 4-6 Cr-Mo steel will last five times as long as carbon steel in cracking furnace tubes, the DM steel two to three times as long, and C-Mo steel about the same as carbon steel. Similar service records of the MM9 and 4615 are lack-

ing, as these materials are intended primarily for applications at lower temperatures where corrosion is less severe.

Unlike the accelerated corrosion tests, oxidation tests made on steels in the laboratory afford a quite satisfactory relative measure of the oxidation resistance of the materials in service. The oxidation resistance of these selected pearlitic alloy steels was determined at 1000 deg. F., 1250 deg. F., and 1500 deg. F. by heating three specimens of each steel at each temperature continuously for 1000 hr. The specimens were in the form of small cylinders 3/4 in. in diameter and 1/2 in. in length. Oxidation of the pieces was accomplished in an unsealed electric muffle furnace with
(Concluded on Page 74)

TABLE 5—TEMPERATURE-STRESS EFFECTS ON THE COLD IMPACT RESISTANCE OF PEARLITIC ALLOY TUBE STEELS

Steel	Heating and Loading Conditions Prior to Cold Impact Testing			Room Temperature Izod Impact Values, Ft.-Lb.
	Temperature, Deg. F.	Stress in Lb. per Sq. In.	Duration of Stress in Hr.	
DM	85	....	....	90.5
	800	21,800	625	89.5
	1,000	20,500	525	90.5
	1,100	10,000	1,335	90.0
	1,200	4,200	650	89.5
4-6 Cr-Mo	85	....	....	99.0
	800	20,660	570	96.0
	1,000	12,500	450	93.5
	1,200	4,000	545	97.5
C-Mo	85	....	....	47.0
	800	24,250	570	33.0
	1,000	20,000	500	38.5
	1,200	3,000	500	66.0
MM9	85	....	....	96.5
	800	40,000	500	95.0
	1,000	14,750	600	91.5
	1,200	3,000	500	91.0
4615	85	....	....	98.0
	1,000	12,500	550	96.0
Carbon	85	....	....	78.5
	800	30,000	1,070	76.5
	900	20,000	590	77.0
	1,000	6,000	1,050	82.0
	1,100	2,500	1,020	74.0
	1,200	1,750	1,590	53.0



▲ ▲ ▲
The operating parts of the wire drawer. "A" is the straightener bushing; "B" is the inching feed; "C" is the inching grip; "D" is the drawing die slide and "E" automatic grips.
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Combined Wire Equipment

DRAWING wire and manufacturing bolts in continuous combined operations with a wire drawer that is attached to a cold heading machine, and which draws and coats the wire and feeds it into the header intermittently as it is needed, is a recent development in the bolt manufacturing industry. The wire drawing machine is operated by power supplied from the header.

Combination units of wire blocks and double-stroke cold bolt-heading machines are being used in the plant of the Wasmer Bolt & Nut Co., Cleveland, and have resulted in marked economies in manufacturing bolts. This method of converting a wire rod directly into a finished bolt is claimed to be of particular advantage to a bolt and nut plant that is not large enough to maintain a wire drawing plant.

The wire drawer is set directly in front of the bolt header and the die is moved back and forth along the wire rod instead of having a stationary die and pulling the rod through the die to draw it down to size. The wire drawing equipment is extremely simple in operation. The stock is fed into the heading machine by the regular feed rolls in the usual manner. During the periods between feeds the wire is held securely by grips and the drawing die is pushed back along the rod a distance equal to the amount fed. When the feed occurs the grips release and the drawing die and the slide which carries it move forward with the rod, being pushed back again during the next stationary period.

The slide which carries the drawing die is of box shape at the top and is

filled with drawing and coating powder lubricant which simultaneously coats the stock for cold heading and extruding operations.

Motion is imparted to the drawing die slide by a vertical lever fulcrumed in the drawer frame beneath the slide, which in turn derives its motion through a long horizontal connecting rod located under the header from an adjustable crankpin at the back of the heading machine. This pin is on the end of a crankshaft mounted in an independent housing rigidly connected to the front drawer frame by spacer bolts and is driven by chain and sprocket from the crankshaft of the header.

The stroke of the mechanism that actuates the die slide is adjustable so that in each cycle the length of the wire that is drawn is the length of the bolt that is being headed, plus enough material to make the head. The wire is drawn during the idle time of the header on the return stroke of the cross-head, when the machine requires a reduced amount of power, so that there is no appreciable increase in power required because of the addition of the wire drawing equipment. The standard headers with which the blocks are equipped are driven by the same motors that were used before the wire blocks were attached to the header.

For starting the end of new coils of rod an "inching" feed is provided. This starting mechanism consists of an auxiliary grip and a feed slide with short stroke hooked up to and operating from the vertical lever. This feed slide pushes the rod for-

ward one to three inches at a time and the auxiliary grips hold it during drawing until the main drawer grips and feed rolls of the header are reached, when the operation is resumed. The use of the "inching" feed makes the pointing or swaging of the rod unnecessary, except for 1/4-in. and smaller sizes, before it goes into the heading dies.

The coil of wire rod is set in front of the wire drawer and, as the material is straightened in going through the block, wire enters the header perfectly straight. In addition, the heat generated in drawing is claimed to be sufficient to cause the metal to flow more easily in the header dies and to prolong the life of these dies. Another factor that tends to extend the life of the header dies is that the freshly drawn wire is clean, while wire that has been kept in storage bins becomes dirty and often collects emery dust which is hard on the dies. A set of tungsten carbide dies has been used in one of the bolt headers since the first wire block was attached to the machine over a year ago, and is still in good condition.

Another advantage claimed for the use of this wire drawing equipment is that because successive coils are drawn through the same die there is no variation in diameter of the wire produced.

Considerable saving in production costs, particularly in raw material, has been effected by the Wasmer company by drawing wire and heading bolts with the combined equipment. The saving in cost of wire rods as compared with wire is about \$15 per ton for plain steel and much higher for alloy steels. The amount of inventory has been reduced one-third, the number of sizes carried in stock has been cut down and the floor space required for raw stock has been reduced 50 per cent. The cost of drawing the wire as an entirely separate wire drawing operation, estimated at \$4 to \$5 per ton, is eliminated. A rod

Drawing and Heading Used in Bolt Making

By F. L. PRENTISS
Resident Editor, The Iron Age, Cleveland

of one size is now used for making wire in two or three sizes and instead of carrying 15 sizes of wire in stock the stock now consists of nine sizes of rods. Formerly wire in 150-ft. coils was used, but these have been replaced by coils of wire rods weighing 350 lb. so that the stock is started into the header at less than half the former frequency, thus saving time.

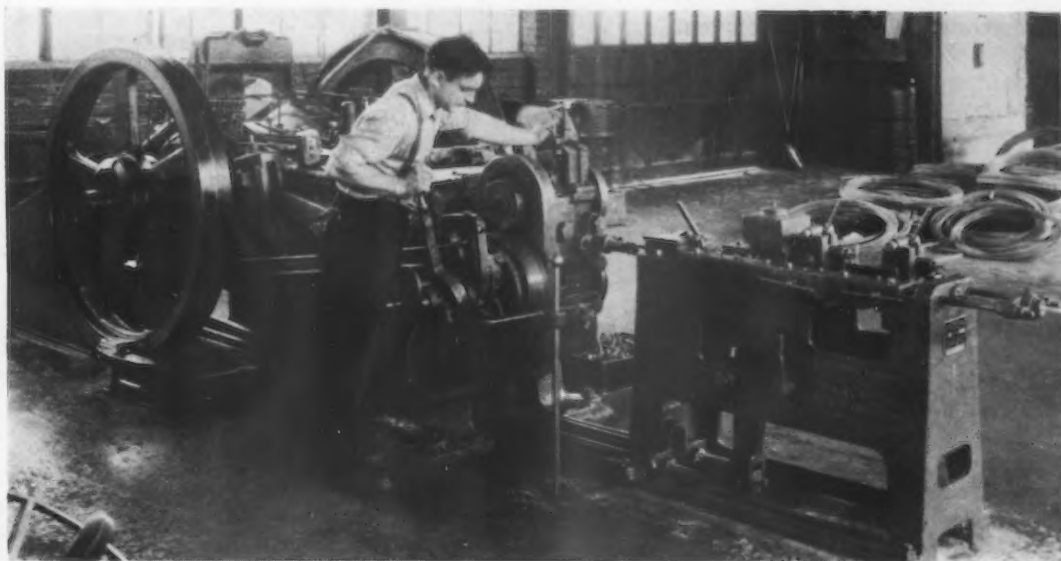
The only increase in floor space that is required is about 4 ft. at the front of each header that is taken up by the wire block.

Wire in plain carbon steel is drawn in diameters from $7/32$ to $5/8$ in., the size being controlled by the capacity of the header. Drafts are usually held to 0.025 in. to 0.030 in., although a reduction as high as 0.090 in. has

been achieved on this wire block.

The wire drawing machine described, which is designated as the Hogue wire drawer, is now being built and placed on the market under an exclusive license by the Ajax Mfg. Co., Cleveland, which will make the machine in standard sizes from No. 0 to No. 4 inclusive, for drawing $1/4$ -in. to $3/8$ -in. diameter rods.

Views in the Wasmer plant showing the set-up of the cold header and wire drawing machine, two units working in combination.



Blast Furnace Fuels: Their R

A RRESTING questions, glimpsing likely changes in the pig-iron making process and suggesting the ascendancy of new or existing iron making centers, occur throughout the accompanying study by Mr. Sweetser. It is an analysis of the part played in the geography of the steel industry by blast furnace fuels and represents a painstaking search of records that here compiled give information hitherto not available. The article brings together some historical facts that will probably be new to many readers and some technical facts that have probably never before been published.

WHAT is the next fuel to be used for the making of iron? Charcoal, anthracite, raw coal ("block coal"), bee-hive coke and now by-product coke have each in succession predominated as the blast furnace fuel used in this country. For nearly two hundred years charcoal was the only fuel used for making pig iron, from the early Colonial days up to about 1840; mineral fuels, natural and processed, have predominated for the past 80 years. Anthracite ruled the pig iron industry for 20 years, and then was supplanted by bee-hive coke for the next 44 years; by-product coke gradually became the almost exclusive blast furnace fuel since the World War. How soon will by-product coke give way to the next fuel? There are some of us who have had experience with all five of these fuels, and have seen the complete dismantling of the 275 anthracite blast furnaces, the disappearance of all but five charcoal furnaces, the passing of all the strictly raw coal furnaces, and the reduction of total active blast furnaces from the peak number of 716 in the year that President Garfield was shot down to the present number of 275 blast furnaces still on the active list.

In order to approach this question in the light of past history, which is "the mold of prophecy," it is needful to review the records of the building of all the blast furnaces in the Colonies and in the States of the Union; to study the influences that brought about the location of blast furnaces at the places they were built and what caused their disappearance or their continuance in that region; to study the influences that caused the movement of the iron-making centers from the shores of Massachusetts westward through the valley of the Hoosatic, the Hudson Valley, the valleys of eastern Pennsylvania, to the valleys of eastern Ohio and the headwaters of the Ohio River.

Will it be water or coal that determines the next blast furnace fuel, or will it be a combination of the two? Charcoal has been used from the beginning up to the present; why? Will anthracite come back, ever? Why is raw coal still used mixed with coke in making a quality product? The two "natural" fuels need no coke ovens, but are distinctly regional in their influence.

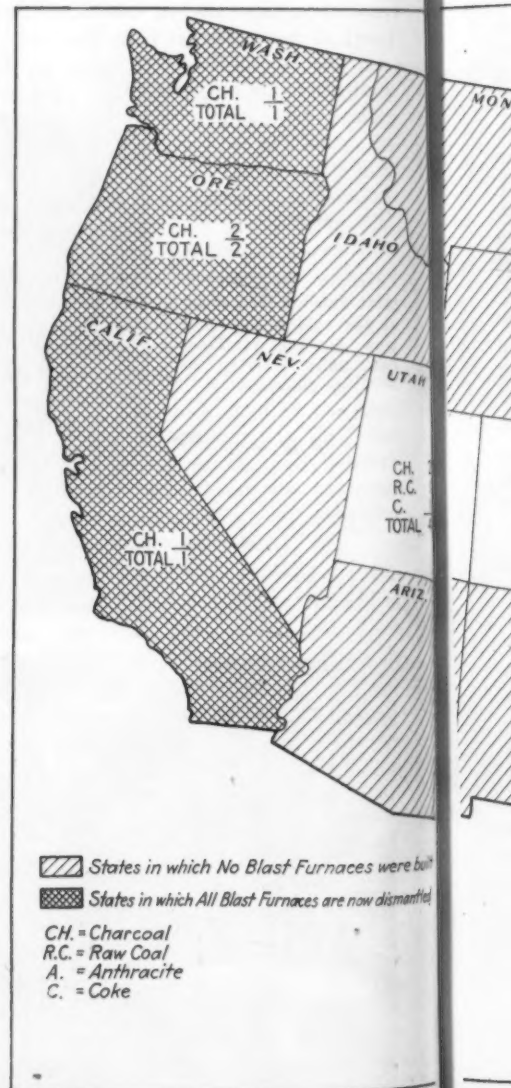
Will it be electricity? And, if so, will the regional influences of electricity as the fuel for smelting iron ores control the location of the iron and steel centers of the future, in the same manner as the other five fuels have done in the past? Or will it help to decentralize? Will the proposed four great hydroelectric power regions of the "New Deal" become the sources of our alloy steels?

Blast Furnace Fuels

CHARCOAL, anthracite, raw coal, bee-hive coke and by-product coke, each in their turn, have had controlling influences, not only on the art of smelting iron ores, but also on the choice of the location of the iron blast furnaces themselves; and also on the building up of the subsequent iron and steel centers of this country. The influence of fuel in determining the location of blast furnaces has been greater than that of the iron ore it-

self, which is the essential foundation of the iron and steel industry. It is a dual foundation, however—units of iron and units of carbon.

It is obvious that there can be no iron smelting without iron ores, whatever fuel may be used; but it has been a fact in the history of iron making that the iron ore was either located at or near the source of fuel



Location of the 1857 blast furnaces built in 33 shortly after it was settled in 1629, up to shows also the 16 states and the District of

Regional Influences

By RALPH H. SWEETSER

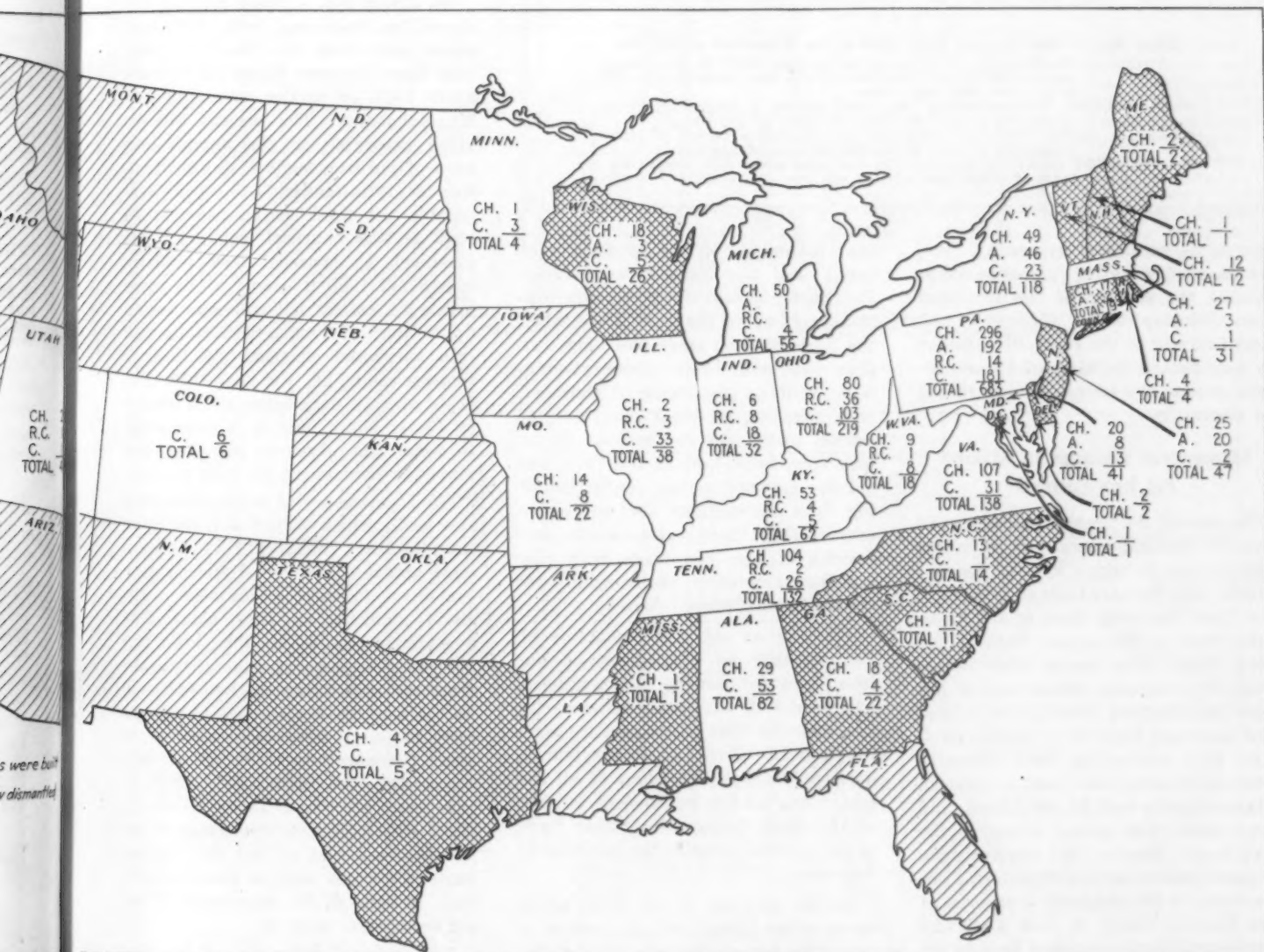
Consultant in Blast Furnace Practice,
Associate, Stuart, James & Cooke, Inc., New York

supply or else the ore was transported to, or toward the fuel. There have been some notable exceptions to this rule which have resulted in unprofitable operation. One such case was the plant at Sault Ste. Marie, Canada, where bee-hive coke was hauled 900 miles or more to meet iron ore that was hauled another 450 miles; it would have been better to have built

up the enterprise on Canadian resources of iron ores and fuels. This has been partly remedied by the building of a by-product coke plant at "The Soo."

The present modern blast furnace practice in America is built up almost entirely around by-product coke as the fuel, and not much remains of the influences of charcoal, anthracite and

raw coal on the art of smelting iron ores, except some traces of the old operating customs. In some cases, like the Sunday shut-down for instance, old customs have been put into present practice and considered as something new. On the other hand, however, the effects of the regional influences of these fuels still persist, and, together with the influences inci-



states and the District of Columbia, since the erection of the first little charcoal furnace near Lynn, Mass., the building of the last big coke furnaces in 1928, at Fairfield, Ala., as shown in Table I. This map of Columbia, which once had blast furnaces, but no longer have a single active stack within their borders.

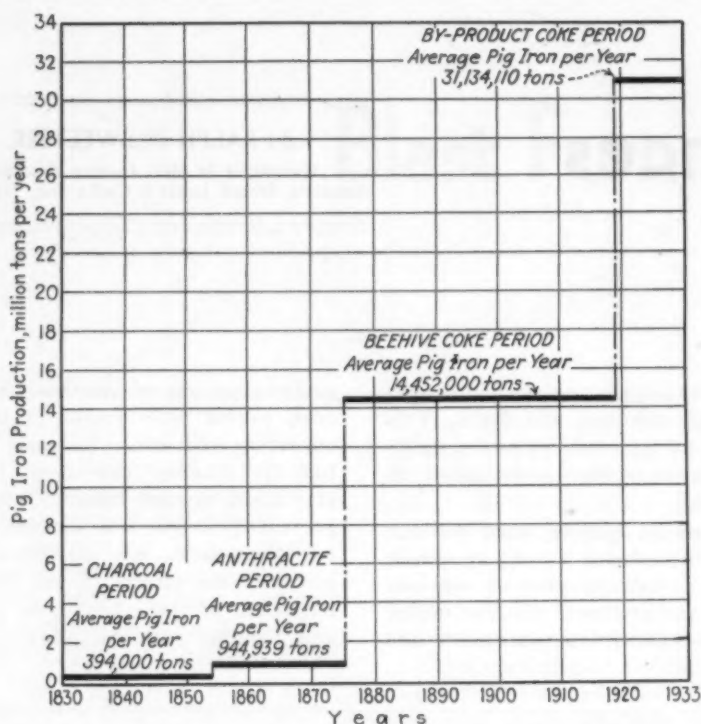


Chart No. 1—Blast Furnace Fuels Used in the Production of Pig Iron.
CHARCOAL: Predominating fuel used during a period of 25 yr., producing a total of 9,851,000 tons of pig iron; previous to 1840, it was the only fuel used.
ANTHRACITE: Predominating fuel used during a period of 20 yr., producing a total of 18,898,792 tons of pig iron.
BEEHIVE COKE: Predominating fuel used during a period of 44 yr., producing a total of 635,888,026 tons of pig iron.
BY-PRODUCT COKE: Predominating fuel used since 1919, producing a total of 435,877,544 tons of pig iron up to 1933.

dent to the making of by-product coke, are the predominating factors in maintaining the centers of the iron and steel industry where they now are. And fuel will be the controlling factor in any future shifting of these centers, even if the source of heat should be electricity.

Momentous Changes in Making Pig Iron Portend

In view of the present evident trend toward regional operations, it seems appropriate to take a look at the record of blast furnace fuels in this country from the early days of the Colonies down to the present time of the New Deal. Like many other industrial developments, the centers of pig iron manufacture have moved inland and westward from the Atlantic Coast. The first continuing blast furnaces were built along the coast of eastern Massachusetts and Rhode Island, and from there they spread across to the Salisbury district in southwestern Massachusetts and northwestern Connecticut, to the magnetic iron ores of the Hudson Valley of New York and northern New Jersey, and then to the valleys of eastern Pennsylvania.

For the first one hundred years after the settling of Massachusetts

that colony led in the production of iron. For the next two centuries Pennsylvania held the leadership continuously, up to the year 1933, when the State of Ohio made more pig iron than any other state. Pennsylvania, because of its abundance of charcoal, of anthracite, of block coal, and of coking coals, and not because of its iron ores, important as they are, has led the country in the production of pig iron throughout the successive eras of these fuels; only in the production of pig iron made with raw coal has any other state—Ohio—exceeded Pennsylvania. Why?

Whether or not this leadership of Pennsylvania as a producer of pig iron, held for nearly two centuries, has passed to Ohio only temporarily is a question that will be settled soon probably in favor of Pennsylvania, because Pennsylvania alone of all the states has within its borders all five of the blast furnace fuels that have so far predominated in the smelting of iron ores.

In the making of pig iron, as in many other things, we are now in a transition period that may bring about as momentous changes as in that period nearly one hundred years ago when anthracite, raw coal and coke

were introduced as blast furnace fuels all within the same decade. These three mineral fuels (two of them being natural fuels) threatened the supremacy of charcoal, which had been the only blast furnace fuel for 200 years; but, as shown on Chart No. 4, no other fuel predominated until 1855 when anthracite took the lead for the next twenty years. Chart No. 2 shows the great activity in the building of new charcoal blast furnaces during that period.

Four Periods of Blast Furnace Fuels

THERE have been four distinct blast furnace fuel eras in this country from the days of the first Colonial blast furnace down to the present time, as follows:

- The Charcoal period from 1645 to 1855
- The Anthracite period from 1855 to 1875
- The Bee-hive Coke period from 1875 to 1919
- The By-product Coke period from 1919 to —

On Chart No. 1 these periods are shown as beginning with 1830 and ended with 1933, but the first charcoal blast furnace began to operate about 1645, or earlier, near Lynn in Massachusetts. The periods are divided according to the annual tonnage of pig iron made with each fuel. Swank (10th Census, U. S., 1880) designates the total period previous to 1840 as "the charcoal iron era," but inasmuch as charcoal iron predominated till 1855 it seems to be more fitting to extend the charcoal period up to the year when anthracite pig iron surpassed charcoal pig iron in tonnage made, i.e., the year 1855. The fuels overlap each other as is shown on Chart No. 4, and it is interesting to note that charcoal pig iron has persisted throughout all four periods.

No separate period is designated for raw coal, which began a little later than the other "natural" fuel (anthracite) and the building of strictly raw coal blast furnaces ended sooner (in 1887), as shown on Chart No. 3. For a while it was possible to keep the records of raw coal furnaces separate from the coke furnaces, but for over half a century the statistical reports have listed all bituminous coal (raw coal) furnaces under the same heading as the coke furnaces. Except in rare cases, such as in Jackson County, Ohio, where there is still some of the Sharon No. 1 coal, no raw coal (either hard or soft) is used as blast furnace fuel, in spite of the excellence of the pig iron made with it.

The regional influences of the five blast furnace fuels can be expressed in terms of the means of transportation employed in each period. Here,

too, there is much overlapping, but the fuels and the transportation facilities are characteristic of each period, as seen below.

Fuel	Transportation
Charcoal	Pack horse—rafts—ox-cart
Anthracite	Canal boat—railroad
Bee-hive Coke	Railroad—ore boats
By-product Coke	Railroad—ore boats—motor truck

The two charts, No. 2 and No. 3, showing the number of new blast furnaces built in this country in each year from 1740 to the present time, give a good idea of the close connection between activity in the erection of new blast furnaces and the building of canals and railroads. Prior to the year 1740 there had been built in the Colonies at least 25 little char-

coal blast furnaces, nine in New England, 11 in Pennsylvania, three in Maryland, and one each in New Jersey and Delaware; the first furnace in New York was built in 1740.

The Reign of Charcoal Iron

"NO other fuel than charcoal was used in United States blast furnaces until about 1840" (James M. Swank, 10th Census of U. S., 1880; Part II, page 59), and many small charcoal blast furnaces were built throughout New England and in all the other Colonies, and later in every state east of the Mississippi River, with the single exception of Florida. The total production was not great, even for all of the first hundred years, throughout which Massachusetts was

the greatest pig iron producer, and even as late as 1810 the annual production for the whole country was only 53,808 tons of charcoal pig iron.

The statistics for those years are rather uncertain and even Lesley and Swank (J. P. Lesley and James Swank, secretaries of the American Iron Association and (later) the American Iron and Steel Association, respectively) expressed doubts as to tonnages previous to 1840. Pig iron, forge iron and air furnace iron tonnages were not carefully separated in the reports. Swank says (10th Census, U. S., 1880) that "about 1840 a revolution was created in the iron industry of the country by the introduction of bituminous and anthracite coal in the blast furnace." Tonnages of the several kinds of pig iron made

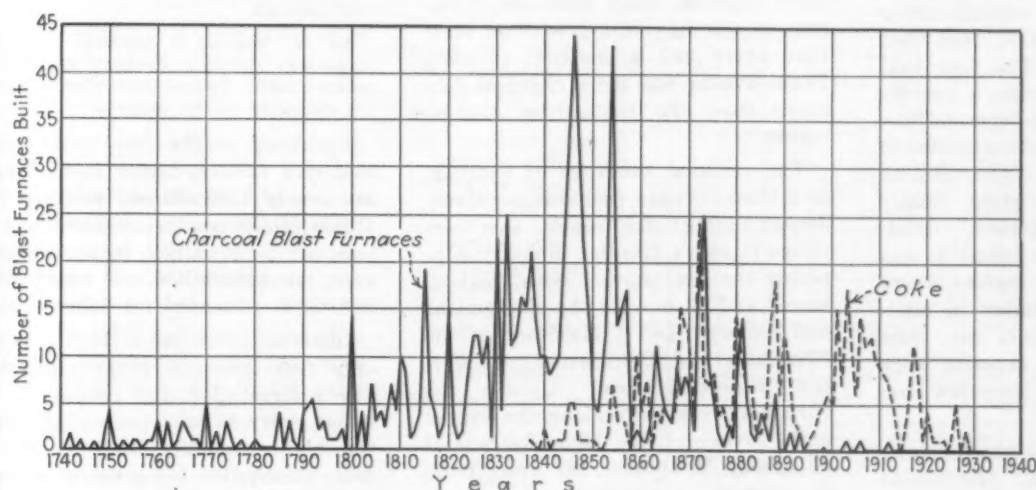


Chart No. 2—Number of Charcoal and Coke Blast Furnaces Built Each Year Compiled from Tenth Census of the United States, American Iron Association, American Iron and Steel Institute and other sources by Ralph H. Sweetser.

Chart No. 3—Number of Anthracite and Raw Coal Blast Furnaces Built Each Year.

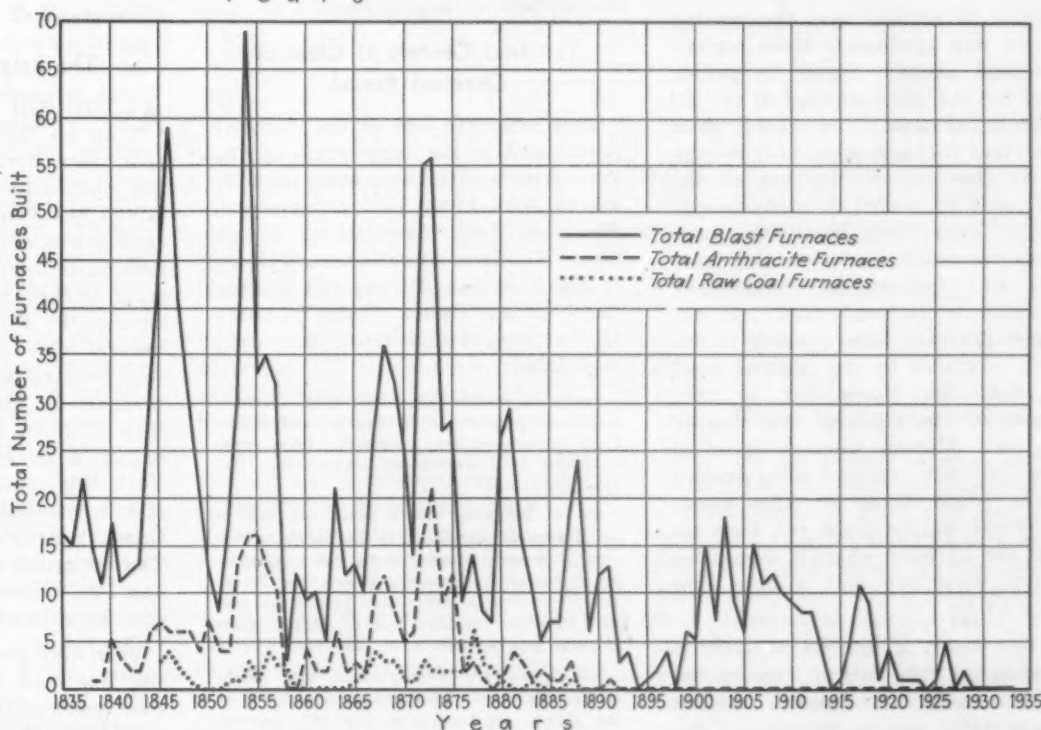
First charcoal furnace built 1645; last, 1912.

First anthracite furnace built 1838; last, 1891.

First raw coal furnace built 1845; last, 1887.

First coke furnace built 1837; last, 1928.

Compiled by Ralph H. Sweetser.



in that decade following the "revolution" are not accurately recorded.

The regional influences of charcoal as a blast furnace fuel still persists today when there are only five "active" charcoal furnaces left in all the country, four in Michigan and one in Tennessee. All five of them are parts of by-product plants of the hardwood distillation industry. These by-product charcoal plants, with wood alcohol, acetate of lime and charcoal as prime products, had to find an adequate market for the bulky charcoal just as the manufactured gas plants had to find a similar market for by-product coke. The iron blast furnace was the logical outlet in both cases; the location of the by-product plant decided the site for the blast furnace.

"For a hundred years after its settlement in 1620, Massachusetts was the chief seat of iron manufacturing on this continent" (Swank, 10th Census of U. S. 1880). The fear that the iron works would create a scarcity of timber made the proprietors of "the first successful iron works established in the Colonies (near Lynn, Mass.) unpopular and their plant finally ceased operations about 1681." Gradually the charcoal iron industry was spread westward to the regions where there was plenty of timber in addition to a supply of iron ore, even though those iron ore deposits were often only "bog ore" of very low iron contents.

Throughout the period which Swank called the "charcoal era," previous to 1840, it is certain that the making of iron was confined to those regions that had enough timber to supply wood for the charcoal used in the little blast furnaces. The records show that these furnaces were near enough to the charcoal pits so that all the fuel could be hauled in ox-carts. In modern times there have been cases where the wood, and even the charcoal, was transported considerable distances in railroad cars. At the largest charcoal blast furnace in the world, operated by the Algoma Steel Co., Sault Ste. Marie, Ont., in 1905, a part of the charcoal was hauled over the Algoma Central Railroad from the brick charcoal kilns erected in the forest 25 to 30 miles away. The wood supply could not keep up with the furnace when it demanded a cord wood pile half a mile long every 24 hr.

After about 200 years of making charcoal pig iron in this country the annual production reached 165,000 tons in 1830; and by the time of the introduction of the use of mineral

fuels, in 1840, the production was 315,000 tons; it was 50 years later that the peak tonnage of charcoal pig iron—628,145 tons in 1890—was reached. Every year since the start in the Colonies (Massachusetts about 1645; Rhode Island 1675; Connecticut 1663), charcoal pig iron has been made in this country. Fortunately for the charcoal industry, the pig iron made with charcoal is superior in quality to all other pig iron. Just why this is so, has not yet been found out.

Charcoal blast furnaces have been built in 32 different states and in the District of Columbia, as can be seen in Table No. 1. This table shows a total of 982 charcoal blast furnaces erected; it is possible that a few have been overlooked. Every state east of the Mississippi River, with the single exception of Florida, has had one or more charcoal blast furnaces; Colorado is the only iron-producing state that never had a charcoal furnace. Pennsylvania had more charcoal furnaces than the next three highest states.

The regional influence of charcoal as a blast furnace fuel was positively decentralizing; for nearly two centuries it was a frontier industry supplying the local market with "hollow-ware" and blooms for the blacksmiths and nailers. Lewis Mumford in his "Technics and Civilization," calls it the "Eotechnic Era." Usually the furnaces were built along the ridges and "coves" of the Blue Ridge and Allegheny Mountains, far away from the centers of population.

Ten Iron Centers at Close of Charcoal Period

Just after the end of the charcoal period and in the early years of the anthracite period, there were (according to John Peter Lesley, secretary, American Iron Association, in his book, "The Iron Manufacturer's Guide to the Furnaces, Forges and Rolling Mills of the United States."—1859) at the close of 1856 ten iron centers as follows:

No. 1. Northern New York, which formerly included Vermont—40 bloomeries and a few blast furnaces—3 now anthracite—from primitive ores (the Adirondack magnetites); fuel chiefly charcoal.

No. 2. Hematite and primary ore belt of the Highlands, beginning in the Salisbury district of western Massachusetts and northwest Connecticut, through northern New Jersey into Pennsylvania, containing 44 charcoal and 22 anthracite furnaces and 60 forges (most of them making iron from the ore).

No. 3. Eastern Pennsylvania, and north-eastern Maryland, the greatest iron region in the Union, 98 anthracite and 103 charcoal furnaces and 117 forges (none of which last produce iron from the ore).

No. 4. Northwest Virginia and southwest Pennsylvania, with its coal measures, carbonate ores—42 furnaces and 2 to 3 forges—Cambria works in this region.

No. 5. Northwest Pennsylvania and northeast corner of Ohio—66 blast furnaces—ore is "buhstone" and other carbonaceous ores at northern outcrop of the great bituminous coal region. All the forging is done in the rolling mills of Pittsburgh and other centers of trade on Ohio waters.

No. 6. The Ironton Region—45 furnaces on Ohio side and 17 on Kentucky side, "which use coal of the mine for fuel" (most of the Kentucky furnaces at that time used charcoal. R.H.S.), and all used iron ores of the coal measures.

No. 7. Old iron-making region of middle and eastern Virginia, a prolongation of the Pennsylvania region, with the same brown hematite and magnetite ores—16 furnaces east of Blue Ridge and 30 furnaces west of Blue Ridge.

No. 8. Northern east Tennessee and northwest corner of North Carolina—9 furnaces (charcoal); South Carolina has 5 furnaces.

No. 9. Western Tennessee and western Kentucky, with its peculiar ores and 45 furnaces (all charcoal).

No. 10. Missouri—a beginning has been made with the Iron Mountain region as a center—already 7 furnaces in blast on brown ore and primitive ore (magnetic).

Speaking of the iron industry of that day (1857), Lesley said, "There are nearly 1200 efficient works in the Union; these produce 850,000 tons of iron per year valued, in an ordinary year, at \$50,000,000, of which \$35,000,000 is expended for labor alone."

Charcoal is unique in that it is the only fuel that can perpetuate itself (by reforestation and cutting in rotation every 15 to 20 years); it makes the highest quality and purest pig iron; it requires the greatest amount of labor, all of which is above ground.

The Reign of Anthracite

ALTHOUGH charcoal was plentiful in all the States that had iron ores, there were only two States having anthracite coal deposits, Rhode Island and Pennsylvania. An unsuccessful attempt to use Rhode Island anthracite in place of charcoal was made as early as 1827 at the Kingston furnace in Plymouth County, Mass. Several other attempts were made in this country and abroad to use anthracite as blast furnace fuel, but they all failed till Dr. F. W. Geissenhainer, a Lutheran minister, of New York City, successfully used anthracite in his Valley furnace on Silver Creek, near Pottsville, Pa., in 1836. The operation was of short duration and Dr. Geissenhainer took sick and died the following May.

This first practical use of anthracite was in a region where iron ore was found near anthracite coal that could be satisfactorily used as blast furnace fuel; some other attempts

failed because the anthracite was not the right sort for blast furnaces.

According to a book written by Prof. Walter R. Johnson in 1841, entitled, "Notes on the Use of Anthracite in the Manufacture of Iron," the legislature of Pennsylvania in 1836 passed an act for the encouragement of the manufacture of iron with mineral fuel. The use of anthracite as a blast furnace fuel progressed rapidly, but the use of bituminous coal and coke went ahead so slowly that Frederick Overman said in his book, "The Manufacture of Iron" (Philadelphia, 1854), "But few blast furnaces work coke in this country * * * as there is but little prospect of an addition to the number of coke furnaces which now exist, we shall devote but a limited space to this subject."

The Franklin Institute, in 1835, offered a gold medal to the first man to make the most iron with bituminous coal or coke in one year—not less than 20 tons. Prior to 1854 only 22 coke blast furnaces had been built, compared to 77 anthracite furnaces.

The use of anthracite coal as blast furnace fuel progressed so rapidly after its first continuous commercial operation at Catasauqua, Pa., in 1840, that in the year 1855, anthracite pig iron (340,951 tons) surpassed the tonnage made with charcoal (303,501 tons). The total amount of pig iron made with bituminous coal and with coke that year was only 55,705 tons.

The valleys of eastern Pennsylvania, tapping the anthracite region, became the centers of the iron industry, and the State of Pennsylvania continued to hold the leadership which has been maintained ever since until the year 1933. With anthracite, however, its regional development was not so restricted as with charcoal, because it could stand transportation by canal boats away from the coal mines. This enabled the iron industry of New England, New Jersey and New York to use anthracite; some anthracite was shipped as far west as Wisconsin and Michigan and mixed with coke as blast furnace fuel, but the dominance in the iron industry remained in the Lehigh, Schuylkill, and Susquehanna Valleys, close to the supply of anthracite.

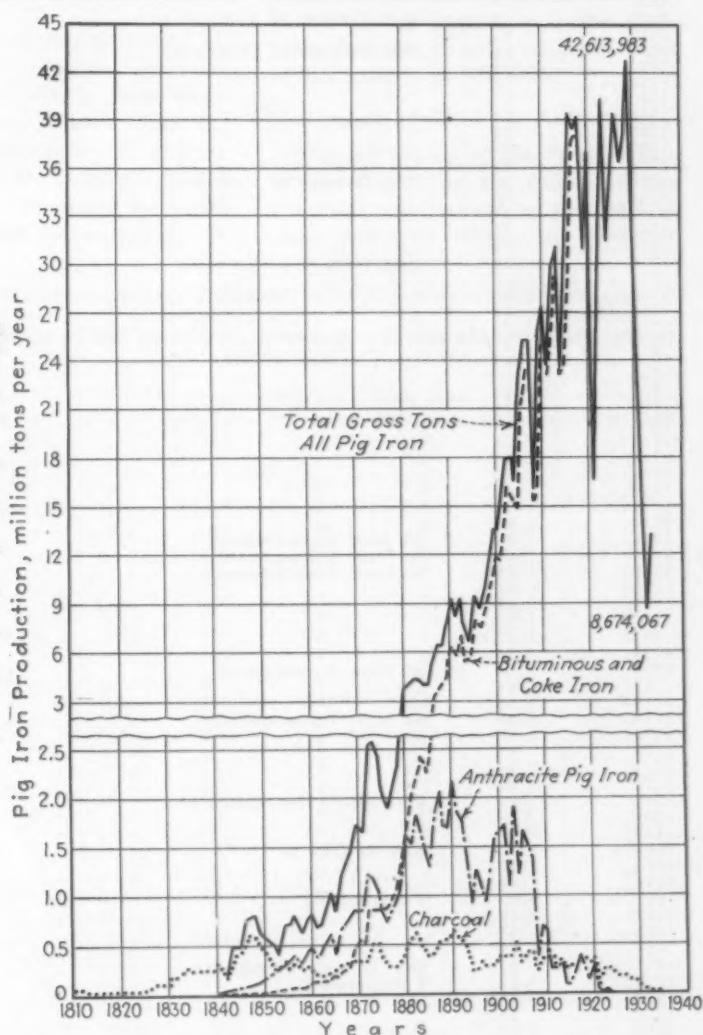
This regional supremacy of anthracite coal in the iron industry continued until the year 1875 when the tonnage of pig iron made with bituminous coal and coke surpassed that made with anthracite. Although the tonnage of anthracite pig iron, and also of charcoal pig iron, was still on the increase, the rate of increase in the use of bee-hive coke was more

rapid, and caused other iron-making regions to be developed, especially in the Pittsburgh region and the "Valley" region of western Pennsylvania and eastern Ohio. The iron-producing regions that had been built up by anthracite continued for a time to increase in capacity, first by using a mixture of coke and anthracite and then by going to all coke as blast furnace fuel. But the regional strength of the Pittsburgh vein of

anthracite coal as a blast furnace fuel, then it reached its maximum consumption in 50 years (1890 was the year of maximum tonnage of anthracite pig iron, and also of charcoal pig iron); for twenty years, 1854 to 1874, more pig iron was made with anthracite than with any other fuel. The last furnace to use 100 per cent anthracite was Alburty furnace, of the Thomas Iron Co., in January, 1914. Carbon Iron Co.'s Parryville furnace

Chart No. 4—Pig Iron Production in United States According to Fuel Used.

All charcoal iron prior to 1840.
Anthracite passes charcoal 1855.
Bituminous passes charcoal 1889.
Bituminous passes anthracite 1875.
Charcoal passes anthracite 1911.
Last anthracite alone 1914.
Last anthracite and coke 1923.
Charcoal in continuous use over 300 yr.



coking coal was too strong, and the center of the iron and steel industry gradually passed over the Allegheny Mountains to western Pennsylvania.

The influence of anthracite furnace practice was carried to other sections of the country by men brought up and trained in the valleys of eastern Pennsylvania, and was felt in the South at Birmingham and Johnson City, and in Ohio and Wisconsin. But anthracite practice was "too slow" and soon gave way to the faster driving practice with bee-hive coke.

If we accept the year 1840 as the beginning of the commercial use of

used a little anthracite mixed with coke in 1923.

False Theory in Use of Anthracite

The use of anthracite as a blast furnace fuel is a striking illustration of the cumulative grief that accrues from false theories and lack of scientific facts. All honor is due those adventurous iron masters who jumped from charcoal, the perfect blast furnace fuel, to anthracite, the hardest of fuels and one that had baffled the European iron masters for many years. It is not an honor to the iron masters of today that we still lack

TABLE II—NUMBER OF BLAST FURNACES ON ACTIVE LIST AT END OF EACH YEAR. (Some of the earlier figures are hard to verify, as opinions differed as to the date a blast furnace was to be stricken from the active list.)

Year	Charcoal	Anthracite	Raw Coal	Coke	Total	Year	Charcoal	Anthracite	Raw Coal	Coke	Total
1645.....	1	first furnace in Massachusetts				1843.....	358	14	0	5	377
1646.....	2					1844.....	382	20	0	6	408
1652.....	3					1845.....	413	27	3	11	454
1657.....	4					1846.....	457	33	7	16	513
1663.....	5	first furnace in Connecticut				1847.....	488	39	9	17	553
1674.....	6	first furnace in New Jersey				1848.....	511	45	10	18	584
1675.....	7	first furnace in Rhode Island				1849.....	526	49	10	19	604
1680.....	7					1850.....	529	56	10	20	615
1681.....	6					1851.....	533	60	10	20	623
1700.....	6					1852.....	545	64	11	20	640
1702.....	7					1853.....	559	77	12	22	670
1715.....	8					1854.....	601	93	15	29	736
1720.....	9	first furnace in Pennsylvania				1855.....	612	109	16	32	769
1725.....	13					1856.....	416	121	19	24	580*
1726.....	14	first furnace in Delaware				1857.....	416	121	19	24	580
1727.....	15					1858.....	417	121	21	24	583
1730.....	19					1859.....	419	121	21	34	595
1732.....	21					1860.....	417	125	21	38	601
1735.....	23					1861.....	417	127	21	45	610
1736.....	24					1862.....	420	129	21	45	615
1737.....	25					1863.....	421	135	21	49	626
1738.....	27					1864.....	428	137	21	52	638
1740.....	28	first furnace in New York				1865.....	431	140	22	57	650
1742.....	30					1866.....	434	142	24	60	660
1744.....	31					1867.....	443	152	28	64	695
1745.....	31					1868.....	449	164	31	79	723
1747.....	32					1869.....	454	172	34	92	752
1750.....	36	first furnace in Vermont				1870.....	459	177	35	105	776
1751.....	37					1871.....	461	183	36	110	790
1753.....	38					1872.....	262	194	32	124	612
1755.....	39					1873.....	284	208	32	138	662
1756.....	40					1874.....	297	221	32	151	701
1758.....	41					1875.....	281	225	33	174	713
1759.....	42					1876.....	280	228	36	170	714
1760.....	45					1877.....	272	231	40	173	716
1762.....	48					1878.....	270	224	41	157	692
1764.....	49					1879.....	267	225	41	164	697
1765.....	52					1880.....	262	226	42	171	701
1766.....	54					Bituminous					
1767.....	55					1881.....	274	223		219	716
1768.....	56					1882.....	252	225		210	687
1770.....	61					1883.....	240	222		221	683
1772.....	63					1884.....	230	219		220	669
1774.....	66					1885.....	181	208		202	591
1775.....	65	at least 3 abandoned				1886.....	175	201		201	577
1777.....	65	at least 2 abandoned				1887.....	175	200		208	583
1778.....	63	at least 2 abandoned				1888.....	162	189		238	589
1780.....	64					1889.....	136	175		225	570
1785.....	68					1890.....	135	173		243	562
1787.....	71					1891.....	121	160		252	533
1788.....	72					1892.....	138	164		267	569
1790.....	76					1893.....	118	141		259	518
1791.....	79	at least 1 abandoned				1894.....	118	142		259	519
1792.....	84					1895.....	96	116		256	468
1793.....	86					1896.....	96	117		256	469
1794.....	88	at least 1 abandoned				1897.....					423
1795.....	89					1898.....	78	94		242	414
1796.....	90					1899.....	80	99		235	414
1797.....	91					1900.....	72	94		240	406
1798.....	93					1901.....	59	90		257	406
1800.....	106	14 built—1 abandoned				1902.....	59	81		272	412
1802.....	110					1903.....	60	77		288	425
1803.....	110					1904.....	56	73		300	429
1804.....	117	first in Ohio				1905.....	55	69		300	424
1805.....	120					1906.....	50	66		313	429
1806.....	124					1907.....	50	56		337	443
1807.....	125	1 abandoned				1908.....	49	45		365	459
1808.....	132					1909.....	49	48		372	469
1809.....	136					1910.....	50	42		382	474
1810.....	64					1911.....	45	35		385	465
1811.....	72	first in New Hampshire				1912.....	45	26		395	466
1812.....	72	1 abandoned				1913.....	45	23		394	462
1813.....	74					1914.....	42	20		389	451
1814.....	78					1915.....	40	20		385	445
1815.....	97					1916.....	40	20		388	448
1816.....	103					1917.....	35	20		400	455
1817.....	106	1 abandoned				1918.....	37	15		407	459
1818.....	107					1919.....	32	13		408	453
1819.....	109	1 abandoned				1920.....	32	11		409	452
1820.....	124					1921.....	28	6		416	450
1821.....	127					1922.....	28	5		416	449
1822.....	128					1923.....	24	2		406	432
1823.....	130					1924.....	24	2		399	425
1824.....	138					1925.....	19	1		375	395
1825.....	150					1926.....	16	1		362	379
1826.....	161	1 abandoned				1927.....	13	1		350	364
1827.....	169	1 abandoned				1928.....	9	0		325	334
1828.....	181					1929.....	8	0		308	316
1829.....	182					1930.....	7	0		293	300
1830.....	204					1931.....	6	0		282	288
1831.....	208					1932.....	5	0		274	279
1832.....	233					1933.....	5	0		270	275
1833.....	235					*Recorded by J. P. Lesley, p. 759, Part II, "The Iron Manufacturer's Guide to the Furnaces, Forges and Rolling Mills of the United States, with Discussion of Iron as a Chemical Element": "To be just in quoting is difficult. One must take names as and where they are published, whatever may be the unknown wrong done to the real workers and thinkers whose discoveries and inventions so often see the light when accredited to other names. . . . In this book every authority is given so far as known."					
1834.....	247	0	0	0	247						
1835.....	262	0	0	0	262						
1836.....	277	0	0	0	277						
1837.....	299	0	0	1	300						
1838.....	313	1	0	1	315						
1839.....	323	2	0	1	326						
1840.....	332	7	0	3	342						
1841.....	340	10	0	3	353						
1842.....	349	12	0	4	365						

knowledge of some of the fundamentals of blast furnace practice.

In the original Letters Patent (on file in Washington, written in long hand) granted to Friederich W. Geissenhainer, Dec. 19, 1833, for his "new and useful improvement in the manufacture of iron and steel by the application of anthracite coal," I find what seems to me to be the foundation of the erroneous belief that anthracite requires three and a half times "the quantity, velocity and density or compression of a blast" necessary and proper for charcoal, and as much greater than for coke in the proportion of three and a half to two and a half. The proportions are expressed by Dr. Geissenhainer as follows:

"Volume, velocity and density" for charcoal = 1.00
"Volume, velocity and density" for coke = 2.50
"Volume, velocity and density" for anthracite = 3.50

It is not surprising that such a conclusion should have been reached by Dr. Geissenhainer at the beginning of a new discovery in blast furnace fuels, but it is surprising to me that there should be so little data on the subject in our blast furnace literature up to date.

Whatever data are available and what actual experience I have had with charcoal and coke in the same blast furnace with the same equipment point to the fact that coke does not require 2½ times as much volume and pressure of blast as does charcoal, and that neither does anthracite require 3½ times as much.

Charcoal used to be considered to contain about 95 per cent fixed carbon, but such is not the fact. It is safe to consider that charcoal is about 70 per cent fixed carbon.

In my own blast furnace experience I found that in the same blast furnace, smelting the same ores to make the same kind of Bessemer pig iron and using the same blowing engines, that it took about 1.44 times as much air blast by volume to burn a pound of bee-hive coke as it did to burn a pound of charcoal (Trans. A.I.M.E., Vol. XXXIX (1908), p. 228). That was at Sault Ste. Marie, Ont., in 1905.

John Birkinbine, in 1879, had the unique experience of running the little blast furnace at Pine Grove, Pa., using three different fuels, charcoal, coke and anthracite, one at a time. He found that charcoal required 81 cu. ft. of air per pound of fuel, coke 92.6

cu. ft., and anthracite 103 cu. ft; this would give the following ratios:

Charcoal = 1.00 volume
Coke = 1.14 "
Anthracite = 1.27 "

I am skeptical, because the tuyere areas for the three fuels were as follows:

	Cu. Ft. Blast Per Min.	Tuyere Area Sq. In.	Blast Pressure, Lb.
Charcoal	2301	42.5	1.25
Coke	2435	28.9	1.00
Anthracite ..	2434	14.7	4.75

This is recorded in Trans. A.I.M.E., Vol. VIII, pages 168-177.

James M. Swank (in Statistics of Iron and Steel Production, Part II, of U. S. Census, 1880), gives some data showing that it took 71.58 cu. ft. of blast to burn a pound of anthracite and 52.37 cu. ft. to burn a pound of charcoal, or 1.366 times as much. This ratio of 1.366 for anthracite to

charcoal is only 94.8 per cent of the ratio of coke to charcoal (1.44 to 1.00) quoted above (Sault Ste. Marie in 1905).

Kreisinger, (U. S. Bureau of Mines, T.P. 137, p. 54) found that anthracite required only 95.6 per cent as much air for combustion as coke.

The average of the above three ratios of air for anthracite to air for coke is 1.005. This, to my notion, means that approximately the same volume of air is required to burn anthracite as to burn coke in the same blast furnace, in spite of the notions of the experts of the '90s.

Pressure of Blast For Anthracite

The old theory of the "penetration of the blast into the center of the crucible" was responsible for the fact that increased volume of blast for

TABLE I—NUMBER OF BLAST FURNACES BUILT IN UNITED STATES FROM ABOUT 1640 TO 1934

	Charcoal Furnaces	Anthracite Furnaces	Raw Coal Furnaces	Coke Furnaces	Total Furnaces
Alabama	29	0	0	53	82
California	1	0	0	0	1
Colorado	0	0	0	6	6
Connecticut	17	2	0	0	19
Delaware	2	0	0	0	2
District of Columbia.....	1	0	0	0	1
Georgia	18	0	0	4	22
Illinois	2	0	3	33	38
Indiana	6	0	8	18	32
Kentucky	53	0	4	5	62
Maine	2	0	0	0	2
Maryland	20	8	0	13	41
Massachusetts	27	3	0	1	31
Michigan	50	1	1	4	56
Minnesota	1	0	0	3	4
Mississippi	1	0	0	0	1
Missouri	14	0	0	8	22
New Hampshire	1	0	0	0	1
New Jersey	25	20	0	2	47
New York	49	46	0	23	118
North Carolina	13	0	0	1	14
Ohio	80	0	36	103	219
Oregon	2	0	0	0	2
Pennsylvania	296	192	14	181	683
Rhode Island	4	0	0	0	4
South Carolina	11	0	0	0	11
Tennessee	104	0	2	26	132
Texas	4	0	0	1	5
Utah	2	0	1	1	4
Vermont	12	0	0	0	12
Virginia	107	0	0	31	138
Washington	1	0	0	0	1
West Virginia	9	0	1	8	18
Wisconsin	13	3	0	5	26
Totals	982	275	70	530	1857

Compiled and arranged by Ralph H. Sweetser. No furnace is counted more than once; thus an anthracite furnace later becoming a coke furnace appears only in the anthracite column.

That is the reason, for instance, that the number of coke furnaces in New Jersey is shown as only 2, whereas there were times when some of the furnaces originally built for anthracite used nothing but coke.

Many of the raw coal furnaces (70 recorded) became coke furnaces later on, and were so classed by the statisticians; but, in the table, when once counted as raw coal furnaces, they were not counted again as coke furnaces. Where anthracite furnaces were completely dismantled and new coke stacks built in their places, as at Bethlehem, the anthracite furnaces were counted once and the new coke furnaces were counted also. Mary furnace at Hokendauqua, built in 1922, is counted as a coke furnace; but No. 1 Hoken-dauqua, built in 1894 and dismantled in 1927, is counted as anthracite although for many years it used only coke.

anthracite was accompanied by a decrease in the diameter of the tuyeres. It is no wonder that the reputation of anthracite for high pressures was prevalent and still persists. The excessive amount of blast per ton of pig iron, as recorded, must be viewed from the standpoint of pioneer work with low-grade iron ores and with an almost unknown fuel. The furnaces were squat, with comparatively large bosh diameter and small hearth diameter. The anthracite was in big lumps, much greater in diameter than the nose of the three little tuyeres.

Prof. Johnson's book, "Notes on the Use of Anthracite in the Manufacture of Iron," published in Boston in 1841, had for its object the immediate recording "in a permanent form and in a connected view an account of the efforts which have been made in different quarters to accomplish the reduction of iron ores with anthracite * * * which may in some degree guide future undertakings in this department of the useful arts."

Atavism in blast furnace practice has always prevailed, and in passing from charcoal to anthracite, the blast furnace men of 1840 were confronted with a much greater problem than were the blast furnace men of the first decade of the twentieth century when they passed from bee-hive coke to by-product coke. Apparently, the anthracite furnace men did not make as much fuss over the change as did the bee-hive coke men, since anthracite for blast furnace fuel made great gains in tonnage and within fifteen years from its introduction it outstripped charcoal in the production of pig iron. It took by-product coke about twice as long to gain predominance as a blast furnace fuel.

One great advantage of anthracite was the fact that it is a "natural" fuel, whereas charcoal and coke are the products of a distillation process and, consequently, require a more or less extensive plant. Only a part of this advantage of anthracite was recognized during the era in which anthracite played such an important part in the development of the iron and steel industry of this country. Even today, after four years of depression and research, the characteristics of anthracite as a metallurgical fuel are not fully recognized.

Block or Raw Coal Furnaces

BLOCK coal, the other "natural" blast furnace fuel, was more scattered in its sources than anthracite, and during the early years of its use raw coal blast furnaces were erected in nine different states. In nearly every case the furnace was adjacent

to the coal mine. The 70 strictly raw coal blast furnaces shown in Table 1 were built during the 43 years beginning with 1845 when three small furnaces, two in Mercer County, Pa., and one in Mahoning County, Ohio, were built to smelt the local iron ores with the local block coal. Within ten years six of the first raw coal furnaces were abandoned, and in western Pennsylvania only six more raw coal furnaces were built after the Civil War.

This region of raw coal blast furnaces, listed as No. 5 of the ten iron centers mentioned by J. P. Lesley, became the great iron and steel region known as the Valleys (Shenango and Mahoning).

The most important regions using raw coal were the Hocking Valley and Jackson County regions of Ohio where the No. 1 Sharon seam of coal was most abundant. More than a third of the 70 raw coal furnaces erected in the country were built in that part of Ohio during the 30-year period beginning with 1858.

Indiana and Illinois did not have much of a charcoal iron industry but both had raw coal furnaces for a short period following the Civil War. Big Muddy furnace built in 1871 at Grand Tower, Jackson County, Ill., was 69 x 17 ft. and had a capacity of 315 tons a week.

With the exception of two furnaces in Jackson, Ohio, making Jackson County Silvery iron, there are no blast furnaces now using raw coal, and these two use it mixed with coke.

The raw coal iron regions of Illinois and Indiana did not develop into permanent iron centers. The Mahoning and Shenango Valleys have become parts of the greatest of our iron centers. Jackson County and the Ironton region are still making iron.

On the whole, the influence of raw coal was the least of all the blast furnace fuels, and its use was gradually abandoned in favor of bee-hive coke. It has been possible to find a separate list of raw coal blast furnaces up to and including the year 1880, but beyond that the raw coal furnaces were listed with the bee-hive coke furnaces and all designated as "bituminous furnaces."

Pig iron made with raw coal has always been considered to be of the highest quality, as is shown by the quality prices now obtained for such irons made in Scotland.

The Great Expansion with Bee-Hive Coke

IT was bee-hive coke and the railroads that made possible the great expansion of the iron industry in the

decade beginning 1870; Chart No. 4 shows the rapid increases in pig iron made with mineral fuels, and Charts Nos. 2 and 3 show the extensive building of blast furnaces for using all four of the fuels at that time. During the ten-year period of 1870 to 1879 inclusive, more blast furnaces were built in this country than in any other decade; it is true that the capacity of the blast furnaces was small compared with those of a later period, but it is the numbers of separate new blast furnaces built that is significant. The new furnaces built in this decade are here tabulated.

Number of Blast Furnaces Built in 1870-1879 Decade

Charcoal	68
Anthracite	75
Raw Coal	24
Coke	79
Total	246

The average number of blast furnaces in condition to make pig iron in those ten years was greater than for any similar period before or since. This pig iron capacity was widely scattered throughout all the States east of the Mississippi River (except Florida), with several furnaces in Missouri; just a few little charcoal furnaces had been erected in any other Western states prior to 1880. About the middle of this decade Pennsylvania had 262 stacks out of a total of 701 blast furnaces on the active list and made nearly half of the pig iron production of the whole country (American Iron and Steel Association Proceedings for 1874, page 35). The total production in the United States for 1874 was 2,401,262 tons of pig iron.

The leadership of Pennsylvania as a producer of pig iron has lasted nearly two hundred years, but is now threatened by Ohio, a State which is practically without metallurgical coal outside of the remainder of the No. 1 Sharon seam in Jackson County. Ohio was the leader in pig iron made from raw coal, and made much charcoal pig iron; however, Pennsylvania had an abundance of both of the natural fuels and of charcoal, and is the greatest producer of by-product coke for blast furnace fuel.

No other state in the Union is so strategically placed and so abundantly supplied with raw materials in respect to the iron and steel industry as is Pennsylvania. It touches the Atlantic seaboard, but so does the State of New York. It has much iron ore, but New York State has ore reserves far beyond any that are in Pennsylvania.

(Concluded on Page 74)

How the Machinery Division of the Department of Commerce Serves The Machinery Industry

THE Industrial Machinery Division (Department of Commerce) was created in 1921 and in 1933 was consolidated with the Agricultural Implements Division under its present title of Machinery and Agricultural Implements Division.

The title indicates the scope of commodities falling under the jurisdiction of this division; for purposes of classification, however, it is considered that "industrial machinery" does not include electrical machinery or equipment, nor locomotives or other railway rolling stock. The term "agricultural implements" is taken to exclude hand tools such as hoes, rakes, etc., which fall within the scope of the Iron and Steel Division.

In the early period of its existence, the efforts of the division were devoted largely to the promotion of export trade, by means of the many specific services available to American exporters under the policy of the bureau then in effect. Special attention was paid to securing foreign sales representation for American machinery makers, and great stress was laid on the distribution of trade opportunities, and on keep-

By R. E. W. HARRISON

Chief, Machinery and Agricultural Implements Division, Department of Commerce, Washington

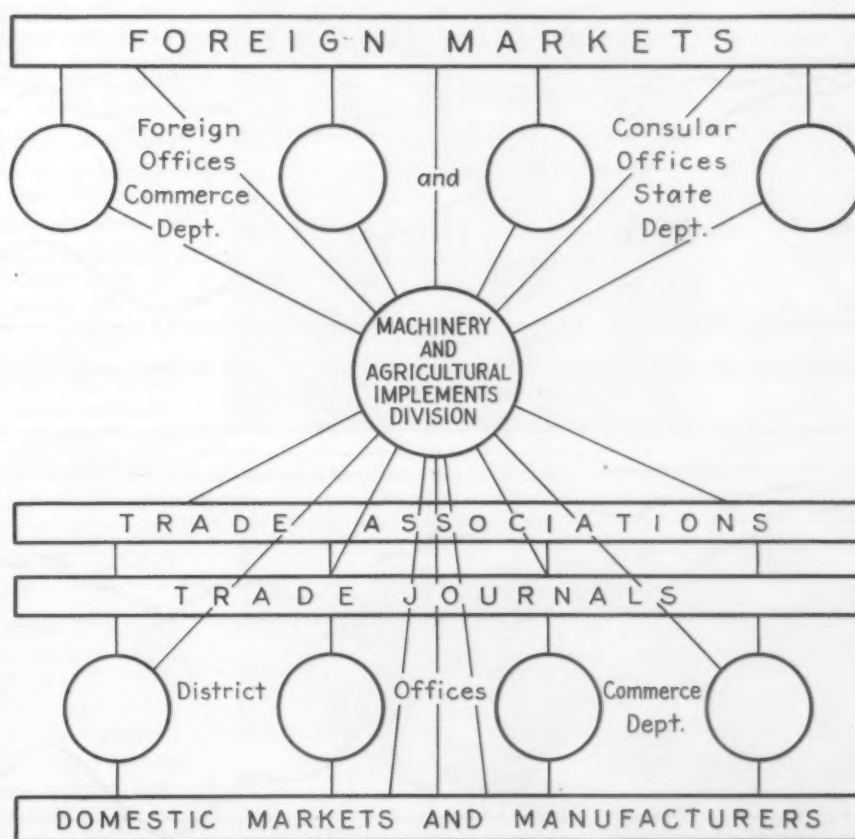
ing a record of "dollars and cents results" of trade promotion work.

Gradually, however, more and more consideration was given to the fundamental domestic problems of the industry. Certain studies of obsolescence of equipment were conducted. Industrial market analysis methods were the subject of intensive applica-

tions, and a technique of such analysis was developed that has proved sound in actual commercial use. The striking effects of business cycles on the durable goods industries were studied from various angles.

The Secretary of Commerce, The Honorable Daniel C. Roper, has frequently stated that the policy of the Department of Commerce is to chart the course and leave it to industry to navigate the ship, but an examination of the situation reveals that the ship of trade in durable goods at the present time is in need of assistance, inasmuch as with capital resources

reduced by 30 per cent, cash resources reduced by 50 per cent, and sales down to 20 per cent of what is considered normal, the ship might be said to have its engines barely turning over, its steering gear impaired, and its navigating officers somewhat bewildered and discouraged; hence it was felt that it would be well within the purview of the division's functions as a service department to the industry for our personal to sit in consultation with the ship's officers in an endeavor not only to chart the course correctly, but to bring



Organization plan of the machinery and agricultural implements division.

about a state of affairs which will insure safer and more comfortable sailing.

The direction of industry has much in common with the direction of an individual business, and before the manager of any kind of an enterprise can set up a policy it is necessary that he be in possession of certain fundamental facts in respect to the project, such as productive capacity, rate of production, his weekly, monthly or yearly wage bill, and some reliable data on average and potential markets. Some of these facts we have, but the most important one, i. e., rate of production and maximum production capacity, we very definitely did not have, and as all measures of operating efficiently must be based on these figures, the first problem was to endeavor to get them.

Cooperation with Machinery and Allied Products Institute

Fortunately for our efforts in this direction, some 12 months ago the machinery builders of the United States decided to form an institution known as the Machinery and Allied Products Institute, which would draw into one organization the 50 or more trade associations engaged in looking after the varying interests of the machinery trade.

During the last 12 months this

institute has gradually passed through the organization stages and has done an outstanding piece of work as the sponsors of the basic code of the industry.

The setting up of codes, however, may be likened to domestic housekeeping inasmuch as they pertain to the domestic economy of the members, but not directly to the generation of profitable business; hence it was inevitable that after what might be termed the house-cleaning mission had been accomplished the members should immediately turn their attention to commercial objectives and this, as will be readily appreciated, was the signal for most active cooperation with Federal and other agencies capable of inspiring business.

A somewhat similar situation exists in respect to the farm equipment industry, and as a result of overtures made by the Department of Commerce the Farm Equipment Institute has gone on record as desiring to cement and augment the facilities for the interchange of factual information which, in turn, will lead to the generation of better business.

One of the first evidences of the new cooperation was the production by the Machinery and Allied Products Institute of charts graphically depicting the business history of each of its member organizations. These charts

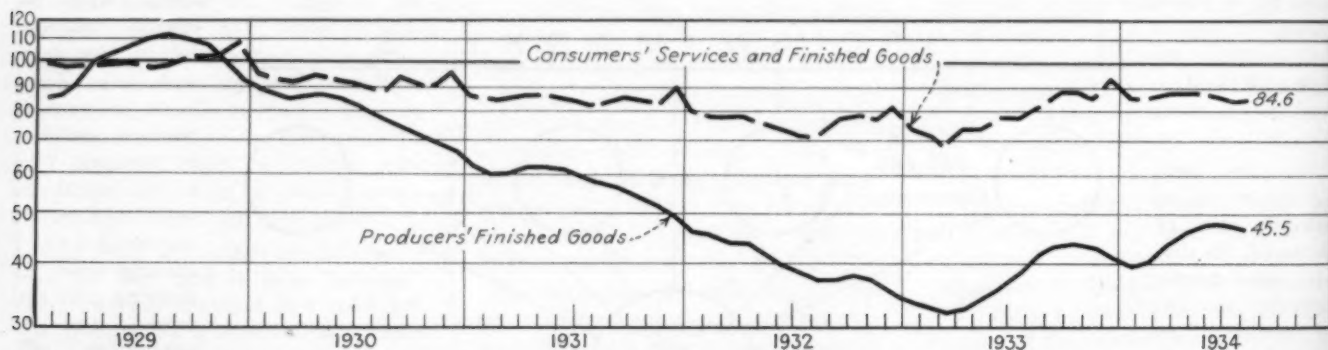
bear out the fact that this typical branch of the durable goods industries is still passing through the most acute phases of the depression.

Briefly, it may be said that the basic problem of the industry today is a sales problem and this, in turn, is aggravated by an acute financial position brought about by the dissipation of its financial resources during the five preceding years of depression.

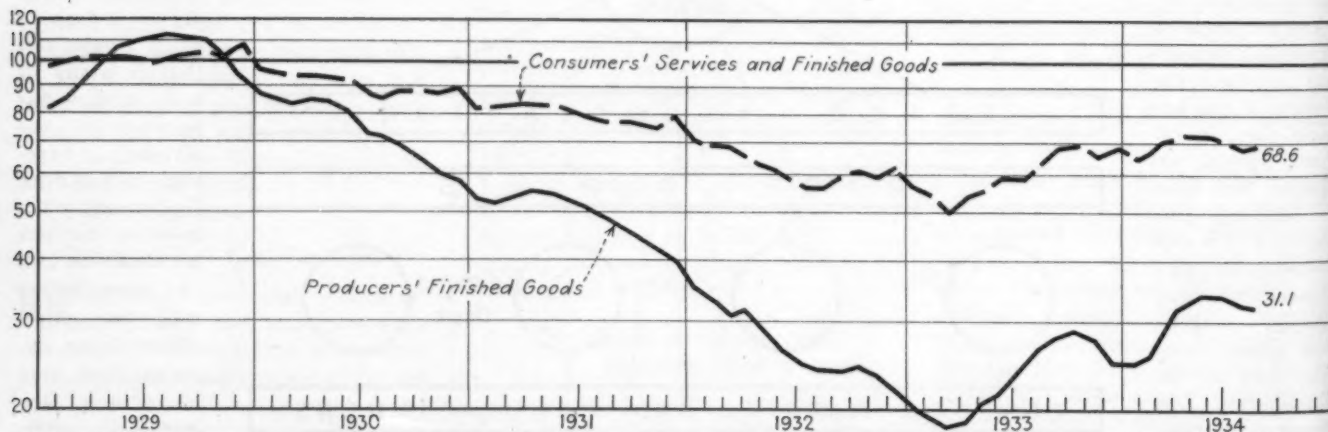
P. W. A. Activities

The machinery industry, including all commodities covered by this division, comes within the durable goods classification, and the state of trade within the industry during the last five years has left a tremendous amount to be desired. In consequence of this it has been decided that it is well within the purview of the activities of the division to assist those trade organizations with meritorious projects calling for the allotment of P.W.A. funds. Two activities of special interest are those pertaining to the recent allotment of \$2,300,000 for the Ordnance Department for the purchase of machine tools and heat-treating equipment and a similar amount requested by the Army Air Corps for rehabilitation and increases in essential equipment for the Army flying fields.

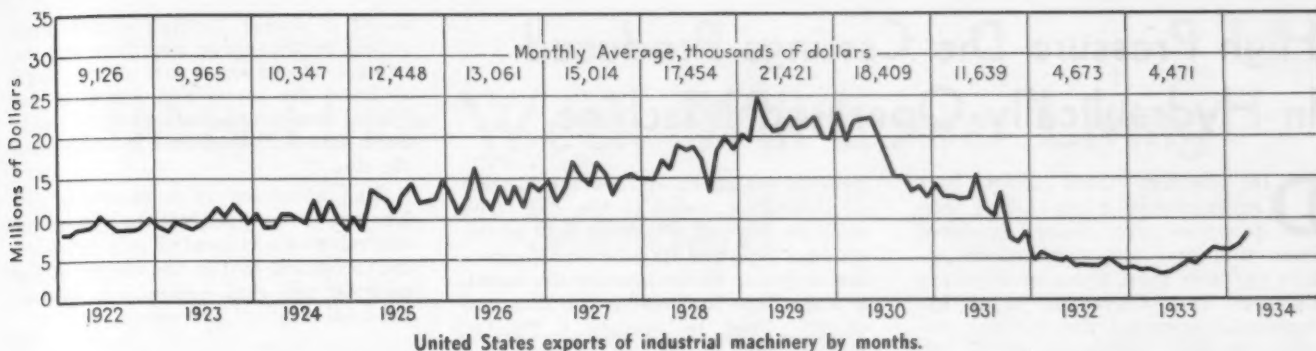
Particular interest in these projects is centered around the man-hours of



Employment in the durable goods industries remains much below that in consumer lines, as shown by these curves of index numbers, base of 100 being that of 1929.



The relatively low level of payrolls in the durable goods lines is shown in these index number curves of the National Industrial Conference Board, base 100 being for 1929.



employment which they will provide plus, of course, the commercial stimulation to an industry which has felt the impact of the depression in a particularly severe way.

Questions Coming to the Division

It naturally follows on account of our numerous trade contacts that we receive a good many visitors during the course of a week and an analysis of the trends of their inquiries is as follows:

(1) What is the state of trade?

Believing that a graphical presentation is the surest means of effecting an economy in words, an endeavor has been made to keep available a current picture of the state of the industry. Charts are used to present the picture and graphs have been prepared dealing with the domestic and the foreign markets.

(2) Where can I secure some business?

The answer to this question is not quite so easy, but insofar as foreign markets are concerned, analyses are available showing potential sources of business for American manufacturers. In the domestic market every effort is made to circulate both commercial and technical information likely to stimulate demand, and attention is drawn to those commodities where there appears to be an opportunity for profitable operation.

(3) What new product could my company make out of which we could hope to make a profit?

The third question is almost equally difficult to answer. With a view to being of service in this direction, by the intelligent selection of projects, the division makes a point of keeping on file for ready reference lists of new developments for which there appears to be an attractive market.

From the impartial viewpoint avail-

able to a department of the Federal Government the fact is borne out time and again that certain of our major branches of the durable goods industries have failed in the past to keep their case for consideration before the public, and wherever possible encouragement is offered to these manufacturers to bring out the fact that the durable goods industries normally provide 60 per cent of the total wage bill, and as such it is very much in

the public interest that they be given major consideration.

It is, of course, impossible in a brief article to do full justice to the scope of the service made available to the industry through this division of the Department of Commerce. Vital statistics, trade opportunities, advice on business policies, etc.—briefly the service is dedicated to the furtherance of American trade — both home and abroad.

Large Shipment of Locomotives to Chile

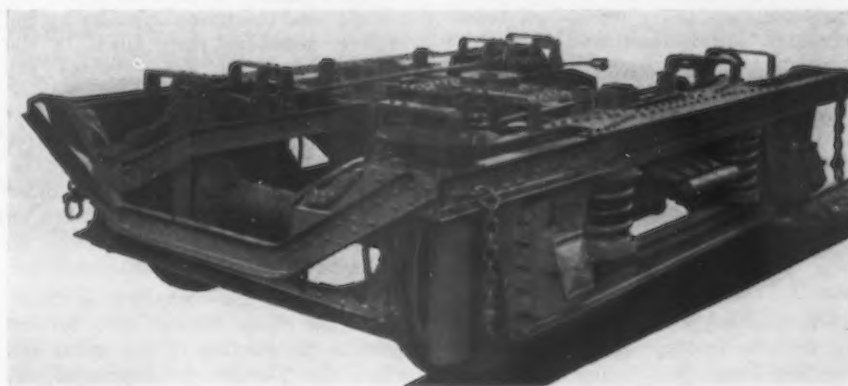


THE biggest shipment of railroad equipment since the beginning of the depression was made by Baldwin Locomotive Works and Bethlehem Steel Export Corp. at the Baldwin Docks near Chester, Pa., Friday afternoon, Nov. 16.

The shipment consisted of 10 locomotives, 10 tenders and 15 first-class passenger cars for delivery to the Chilean State Railways.

Don Manuel Trucco, Ambassador of Chile, received the cars on behalf of his government. S. M. Bash, vice-president of Bethlehem Steel Export Corp., and Robert S. Binkerd, vice-president and director of sales of Baldwin Locomotive Works, conveyed greetings for American industry. The affair was followed by a dinner to the Ambassador, and to the consular officials representing Latin American countries at Philadelphia.

The passenger cars were built at the Harlan plant of Bethlehem Steel Co., in Wilmington, Del. They are steel coaches with wood interior finish, weighing 102,000 lb., carried on two four-wheel structural built-up trucks. The gage is 5 ft. 6 in.



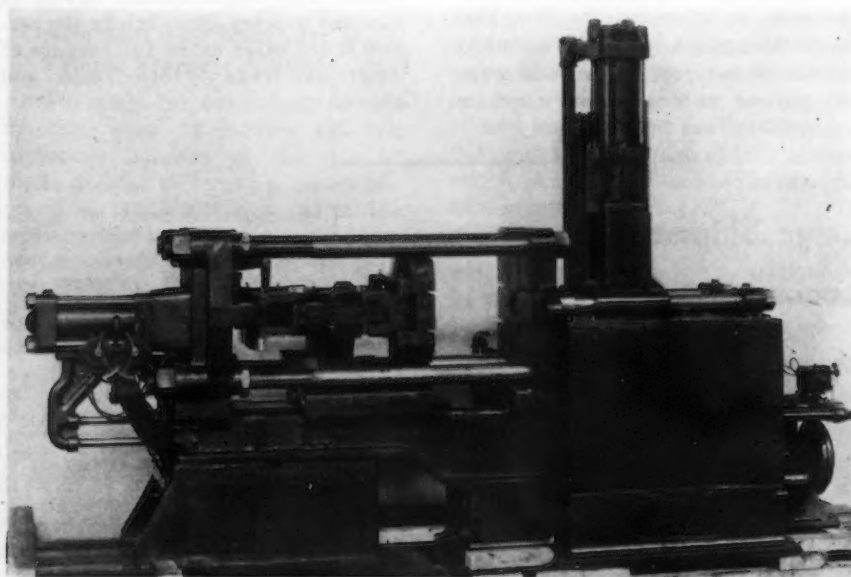
High Pressure Die Castings Produced In Hydraulically-Operated Machine

DIE castings made under high pressure with a low casting temperature are being produced from zinc base alloys, aluminum alloys and also from brass by Pressure Castings, Inc., Cleveland, in an hydraulically-operated die casting machine recently developed by N. N. Lester, chief engineer and vice-president of the company.

In the operation of the Lester machine the metal is cast at a temperature only slightly above its melting point. The casting temperature for zinc is 730 deg. F., for aluminum 1150 deg. F., and for brass 1500 deg.

general design except for the method of delivering metal to the die. The machine is a self-contained unit of the plunger type and its only attachments are to gas or oil for heating the metal, a water line for cooling the dies and electric lines to operate a 7½-hp. motor. The motor, mounted in the base, supplies all the power needed for operating the machine at maximum speed, the power required being claimed to be less than that of any other die casting machine operated at the same production rate.

The required motor capacity is reduced by having the pump work in



F. The pressures that are being used in production work in the plant are: zinc 3000 lb. per sq. in., and aluminum and brass 7000 to 12,000 lb. per sq. in. However, the machine will exert pressure up to 17,000 lb. per sq. in. if such high pressure is desired in making castings of copper base alloys. In common practice the pressure range is usually from 350 to 1000 lb. per sq. in. in making zinc die castings.

The high pressures permit non-ferrous metals to be worked at temperatures lower than would be required were the machines fed by gravity or that are usually maintained when making die castings in pneumatic-type machines. They eliminate some of the difficulties that have been encountered in making die castings of metals having a high melting point.

One Machine for Zinc and Another for Aluminum and Brass

The machine is made in two models, one for zinc and the other for aluminum and brass, both being similar in

combination with an accumulator mounted at the side of the machine. This is filled with nitrogen gas having a pressure of 500 lb. per sq. in. in the tank. This pressure is built up to 1100 lb. by pumping oil into the accumulator until it fills about 50 per cent of the interior area of the accumulator tank.

Between the shots the pump has time to begin to rebuild pressure in the accumulator to 1100 lb. Oil is delivered into the pump cylinder at the 1100-lb. pressure maintained in the accumulator. As the area of the plunger is only one-third of that of the hydraulic cylinder the pressure of the plunger is stepped up about three times, or to about 3200 lb. per sq. in. The wearing surface of the cylinder and plunger is automatically taken up so that there is uniform pressure on the metal at all times.

Zinc enters the compression chamber of the pump through inlet orifices beneath the surface of the metal and when the plunger is depressed the

metal is forced through a gooseneck nozzle to the sprue and into the die cavity. The exposed part of the nozzle between the sprue and metal is gas heated to prevent cooling of the metal as it passes through the gooseneck to the die.

Zinc is melted in a cast-iron pot. The pot is equipped with a pyrometer control which is located in a cylindrical receptacle cast in the corner of the melting pot and controls a Minneapolis-Honeywell gas regulator.

Dies Opened and Closed Hydraulically

The die is opened and closed by a hydraulically-actuated toggle mechanism which is self-locking when the die is closed, so that no pressure is required on the die while the shot is being made.

The machine is operated by two conveniently located control valves, one for the die operating mechanism and the other for the plunger. When the die is opened after a shot has been made ejector pins are pushed forward automatically, ejecting the casting from the die. The operator then removes the casting from the machine with a pair of tongs. Most of the cores, probably 90 per cent of them, depending on the design of the die cast piece, are pulled out automatically. Dies are cooled by a continuous circulation of water, the amount of which is controlled by a valve for each water line. Dies for zinc castings are made of chrome-vanadium steel. Those for aluminum are of pressure die casting steel and those for brass are of Poldi die steel.

Speed of production depends upon the work, but averages about 200 shots an hour. Multiple die heads are used for some work, making three castings to a shot and thus increasing the output.

Aluminum and brass are melted in refractory pots that are covered to exclude the air and minimize oxidation. The compressor chamber, instead of being vertical as in the zinc machine, is in a horizontal position and the metal is poured into the cylinder with a ladle through an opening at the top. The cylinder is made of nitrided steel. The plunger, also of nitrided steel, is 1¼ in. in diameter; it is much smaller than in the zinc die casting machine, in order to secure the higher pressure required.

As the plunger is moved by hydraulic cylinder its action is not as rapid as that of a pneumatic type machine and a definite period of time is required for the actual injection of the metal into the die cavity. Although this time is only a fraction of a second, it is said to be long enough to allow complete scavenging of the air from the mold, assuring solidity of the product.

The high-pressure method of making die castings with low melting temperatures is claimed to have, as

(Concluded on Page 72)

Thirty-Hour Week Will Lower Living Standard

THE United States cannot produce more than the people as a whole would like to consume. Even in the gay twenties the country was not living beyond its capacity—as measured by what we could produce.

Such are findings of an investigation made by Maurice Leven, Harold G. Moulton and Clark Warburton under grants from the Falk Foundation, Pittsburgh. The data and conclusions have been made available in book form in a volume entitled "America's Capacity to Consume," published by the Brookings Institution, Washington. The facts brought out will be reassuring in circles which yet own to misgivings as to the portent of so-called technological advances, and as they are more generally appreciated, they will help instill the confidence so necessary to a revival of something like normal industrial and business activity.

Too long has the view been held, and widely at that, that the economic machine has gorged us to the point of universal indigestion. Current Government policy represents very largely an embodiment of the idea, with its urging to shorten the working day and generally to restrict output, and its assumption that through such practices will lie the maintenance, if not the increase, of the standard of living.

Do Not Believe the 30-Hr. Week Is Yet Here

Actual goods and services produced in 1929, it appears, had a value of about 81 billion dollars. The potential production (with existing methods) was equal to about 20 per cent more than the actual production, or 97 billion dollars. The actual production of consumption goods is placed at 70 billions and the potential at 86 billions. The actual production of 1929 was accomplished on an industrial work week which averaged close to 51 hr. The potential 1929 production of 97 billion dollars (which assumed no unemployment or slack employment) was predicated, in the investigators' calculations, also on the assumption of an average working week of 51 hr. If we were to shorten the working week to 30 hr., they argue, as has frequently been suggested, with a view to absorbing all complete and part unemployment, the maximum of production would be greatly reduced.

IN 1929 the industrial week averaged 51 hr. Pretty nearly everybody who wished to work was employed. The question is, does anyone believe efficiency has so increased meanwhile that the 1929 volume of production could be realized with a 30-hr. week? Is it not likely there would be difficulty in repeating the 1929 outputs until the industrial machine has overcome the effects on personnel and equipment of drastic curtailment, not to mention the prohibitions against increasing capacity?

Besides all that there is grave question that the standard of living five years ago had been lifted unduly high. There were nearly 5,800,000 families in 1929 having incomes averaging only \$650 per family; there were in fact 16,225,000 families in that year none of which had an income of more than \$2000. Yet a family income of \$2500 "permits few of the luxuries of life, even for families of only two or three persons."

"Assuming no change in man-hour efficiency," they explain, "the reduction from the 1929 basis would be two-fifths, giving a production of 58 billion dollars (of which about 51 billion would be consumption goods). If we assume that improved technique and methods may have increased man-hour productivity since 1929 by as much as 25 per cent, the production of consumption goods on a 30-hr. week basis (for the same population as in 1929) would be approximately 63 billion. Under these conditions, consumption would have to be reduced below the 1929 level by some 10 per cent, since consumption in 1929 was about 70 billion. On a 40-hr. week, with a 25 per cent increase in efficiency and the same level of employment as in 1929, production would be approximately the same as in 1929."

In summarizing, the authors say: "If we have a 30-hr. working week, with complete utilization of our labor force and productive establishment, and then assume a universal increase

in efficiency in agriculture, mining, manufacturing, transportation, marketing and other branches of industry of as much as 25 per cent, we would still have a productive output considerably smaller than in 1929. Unless we can be sure of a vast increase in productive efficiency the working day cannot be appreciably shortened without a curtailment of production, and, in consequence, without reducing consumption standards below the level of 1929."

Not Yet the Age of Abundance

The authors assert that we have not yet reached the age of abundance of which we all like to dream and extensive leisure has not as yet been forced upon us as an alternative to a surfeit of goods and services. In short they repeat: "We cannot materially shorten the working day and still produce the quantity of goods and services which the American people aspire to consume."

In looking to the future, the authors think that the most that can be hoped for is a gradual increase in productive output, as existing plant and equipment can be replaced by more efficient types and as new methods can be progressively introduced. Parenthetically they recall that during the great era of technological advancement between 1900 and 1929 per capita production in the United States increased by less than 40 per cent. They hold that in due course a much larger production for the same expenditure of human energy may be expected, but point out that the drastic curtailment in production schedules during the depression in the so-called capital producing industries "affords rather conclusive evidence that in general the productive capacity of our industrial establishment, so far as plant and machinery are determining factors, has not been increased materially since 1929."

The investigators also emphasize that we are not desirous of merely restoring the standard of living to the unsatisfactory level hitherto prevailing—measured, say, by the fact that in 1929 there were 5,779,000 families having incomes of less than \$1,000 and averaging \$650, 5,745,000 families of incomes of \$1,000 to \$1,500 and 4,701,000 families of \$1,500 to \$2,000 income, to be considered in the face of the fact that a family income of \$2,500 "permits few of the luxuries of

life, even for families of only two or three persons."

Production Is the Answer

They take a look also at the prevalent notion that the problem of production has been completely solved, leading many people to conclude that all we need to do to remove our economic difficulties is to increase, by some means or other, the money income of the public—that nothing else is of any importance. "No matter how much we may increase wage rates

with a view to expanding purchasing power, we will not find available in the market places the goods which minister to the satisfaction of human wants unless they are produced. Whether we live under a wage, price, and profit system or under a completely communistic method of economic organization it will always be true that the level of consumption or the standard of living can be raised only through the production of food, clothing, shelter, comforts and luxuries."

world, and reference to the chart which indicates that the upward progress started in the spring of 1933 will be continued. To restore its former position, however, will call for a greatly increased degree of effort in both the domestic and foreign markets and the feeding in of many new ideas.

The thought still grows that the productivity of machine tools can be enhanced by a lightening of the metal-removal burden. Hence, many production engineers are calling for forgings to much closer tolerances, sand-molded castings with the bare minimum of surplus metal, together with die castings and hot-brass pressings, all of which are designed with the object of reducing naturally the number and the extent of the machining operations.

In addition to this, the increased use of plastic compounds, as for example, in the manufacture of noiseless gearing, and many other practices formerly considered impracticable because of limitations in tensile strength are all exerting a marked effect. In many cases the plastic compounds can be molded to finished size without machining, and when parts do require machining the surplus material can be removed in a much quicker time than would be the case with some metallic substance.

Growth of Surface Broaching

The phenomenal growth in the practice of surface broaching has resulted in the placing on the market by a number of companies of individual and complete lines of surface-broaching equipment. Almost invariably where these machines have been applied the resulting increase in production and the favorable length of tool life have reduced materially the costs of production. A significant

(Concluded on Page 72)

Progress in Machining Practices

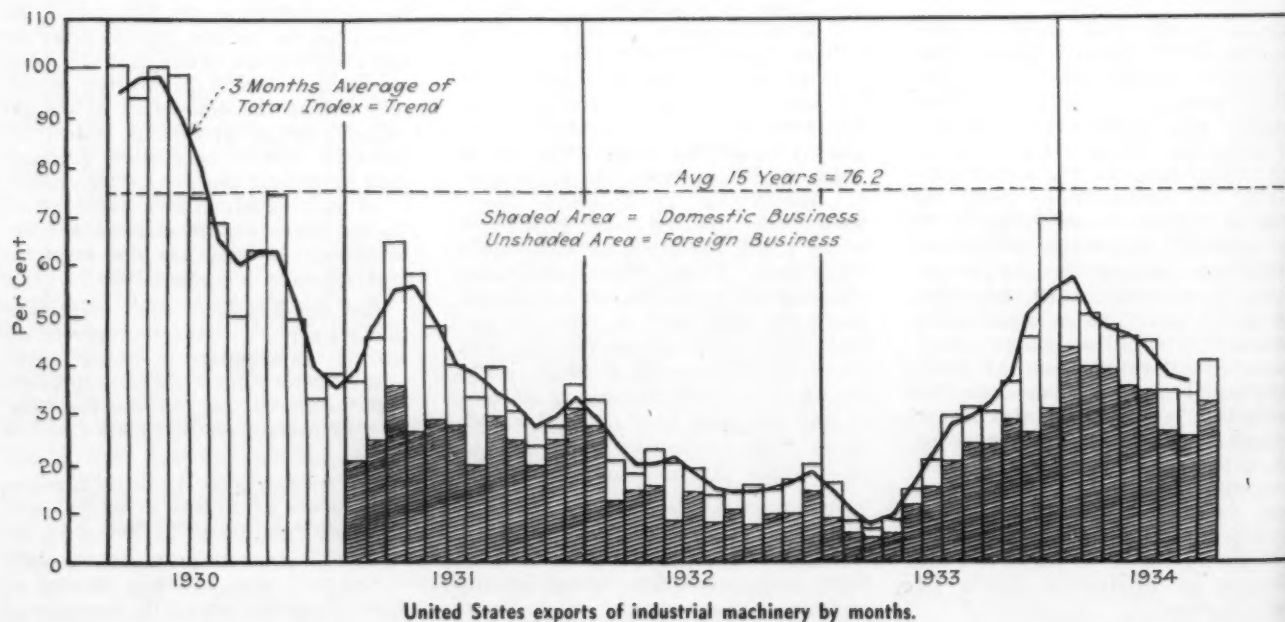
PROGRESS of the current year in machining practices features a report of the Machine Shop Practice Division of the American Society of Mechanical Engineers. The report will become a matter of record in connection with the annual meeting of the society to be held in New York the first week of December. It was written by the secretary of the division, R. E. W. Harrison, who is chief of the Machinery and Agricultural Implement Division of the Department of Commerce, Washington. The following represents a fairly full reprinting of Mr. Harrison's observations:

The Economic Situation

A review of the activities of the past year in industries producing and using machine tools reveals increased evidence of the severity of the depression and the struggle being waged to maintain and advance technological progress, and a tendency in certain uninformed quarters to fix the responsibility for all the social ills of the machine age on to the heads of the

technicians. The slowing up in technological progress, due to the depressed state of the durable goods industries which are the main users of high-grade machine tool equipment, the shortage in skilled help, which is a direct result of the five years of depression, and the exhaustion of much of the capital and cash resources of the organizations which normally provide the stimulus for industrial development, have all combined to impose a severe handicap on an industry which is essentially the keystone of the industrial, social and economic structure.

The manufacturing technique of the United States developed primarily to meet the needs of an immense domestic market has spread throughout the civilized world, wherever markets have been presented, calling for treatment similar to that which has proved successful on this side of the Atlantic. No more convincing evidence of the penetration of this technique is provided than by the number of American machine tools which are seen in the manufacturing workshops of the



Upright Drilling Machines Provide Supplementary Hand Feed

THE controls featured by the Fostick Machine Tool Co., Cincinnati, in the new line of Economax drills are summarized below. Illustrations are on page 36.

Single-lever shifts for 12 spindle speeds.

Single-lever shifts for nine spindle feeds, and having engagement control by either of two quick-return levers conveniently located.

Spindle reverse applied by a reversing switch located on the sliding head and also used for quick stopping of spindle.

Multiple disk-clutch drive, with drive from motor directly through pinion and gear to the start, stop and reverse frictions. Adjustment of the forward friction by adjusting nut, without removal of cover plates and without disturbing inclosed oil. The frictions are ball bearing, mounted on a multiple-splined shaft. In addition to the tripping of the feed clutch at predetermined depths, hand-trip provision is made that full spindle travel beyond the automatic depth may be had. The hand-trip can be set by a direct reading, graduated dial for spot-facing, counter-boring, gap-drilling or for use where more than two depths are required. The dial is pictured on page 36.

All gears are of alloy steel, heat treated, and are ball bearing mounted on multi-splined, chrome-nickel shafts. Lubrication is an oil spray developed by a submerged constant speed pump.

The spindle is multi-splined and is driven by a long, alloy steel, heat-treated sleeve extending completely through the housing for the prevention of oil escape. The rack teeth are cut directly on this sleeve, which carries one gear for high speeds and one for heavy back gears; these are rigidly mounted between ball bearings. There are no sliding gears on the spindle, which also is ball-bearing mounted.

The speed box provides 12 speeds, 60 to 150 r.p.m., obtained from a constant speed motor of any speed. The range of feeds is from 0.005 to 0.043 per revolution of spindle. On the motorized spindle type any number of spindle speeds from 1 to 8 can be obtained with a range of 75 to 1800 r.p.m., and one to nine feed changes can be had with a range of 0.005 to 0.043 per revolution of spindle. The sliding head is of heavy design; the sleeve has a bearing equal to the head bearing on the column. The head is counter-balanced and is operated by a fixed handwheel. A self-compensating head and column clamp are used. The feed mechanism is inclosed.

Both round and box-column type machines are built; the round is braced

at the center of the rear support; the box column is one-piece design with table fitted to dovetailed ways and operated by a telescopic screw.

The box-column machine with motorized spindle is shown on page 36, an insert shows the sliding head with graduated feed hand dial. An indi-

Grinder Operates Hydraulically or by Hand Through Quick Action Latches

NORTON CO., Worcester, Mass., announces a new cylindrical grinder in its type C line, as shown on page 36. The machine has a nominal swing of 6 in., and is built in two lengths for either 18-in. or 30-in. centers.

Patterned after the 10-in. and 16-in. type C machines described in *THE IRON AGE*, Nov. 23, 1933, this new 6-in. has a self-contained wheel unit and uses a standard 20-in. diameter grinding wheel. The wheel spindle, which is 50 per cent heavier than in earlier 6-in. machines, is end driven by V-belts direct from the mounted motor, no idlers or intermediate shafts being required. Spindle bearings are made of hard bronze and are flood lubricated with filtered oil. Spindle reciprocation is optional. Wheel slide ways are force-feed lubricated and have 20 per cent greater bearing area than earlier models.

The work carriage consists of a sliding table traveling in a vee and a flat way in the base and which supports a swivel table pivoted to it at the center. Both table ways are force-feed lubricated under patent license from the G. A. Gray Co.

The headstock, footstock, steadyrest, center pointer and radial truing device are clamped to the swivel table. Headstock and footstock centers are increased in size. The footstock is operated by a lever of increased length. The headstock is driven by an adjustable speed D. C. motor with either a rheostat or drum controller to provide a wide range of work speeds. In addition, a vertical rather than horizontal lever operating a clutch and brake is provided.

Power traverse machines are hydraulically propelled, the oil pump and its driving motor being an integral unit conveniently mounted within the base. Reverse and throttle valves are of the design used on larger Norton type C machines. The table is traversed by a double rodDED piston connected to each end with a quick-acting latch. This piston travels in a cylinder attached to the base

vidually driven coolant pump, bolted to the base and submerged in the coolant, can be supplied, also chip pan.

Three machine sizes, 21 in., 25 in. and 30 in., are specified for each, the round and the box-column types. Gear-driven models employ any speed motor, 1200 to 1800 r.p.m. The motorized spindle upright can use either a constant speed motor or, for more than one spindle speed, a multi-speed motor, 450 to 1200 r.p.m., or 600 to 1800 r.p.m. A drum controller is used with multi-speed outfits.

and table speeds from 7 to 360 in. per min. are available. The table can also be moved by a hand-wheel which is automatically disconnected when the power traversing units are engaged. Quick-acting latches permit disconnecting the piston altogether, thus affording a means of operating the table by hand independently of the hydraulic system.

For plunge-cut operations only, a hand traverse unit is substituted for the power traverse. This unit has a slow speed for wheel truing and a fast speed for moving the table into grinding position if necessary. The change from one to the other is by means of a knob on the hand-wheel.

Both hand and power traverse machines can be equipped with a hydraulically operated wheel head traverse unit. This unit moves the wheel head rapidly in and out between grinds for as much as 3 in., if required.

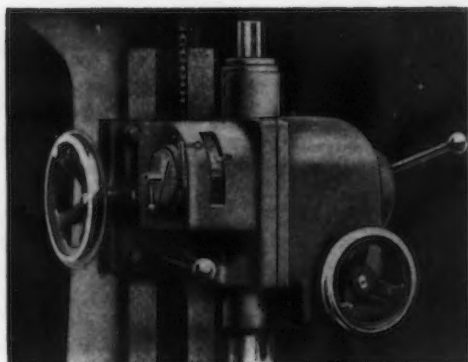
New Portable Foundry Unit Reconditions Sand

THE screening and reconditioning of used molding sand is the purpose for which the Jeffery Mfg. Co., Columbus, Ohio, builds a portable equipment, pictured on page 37. The frame is a one-piece steel casting, mounted upon 14-in. diameter, roller bearing wheels and is operated by a fully inclosed motor through a V-belt inclosed in an aluminum cast housing. Push-button control is provided. The shoveling height is 26 in. above the floor level. A positive, eccentric type, vibrating screen is used, with a side chute for the segregation of refuse, while an end chute distributes the reconditioned sand in windrows or piles. No operating chains, gears, rollers or studded bolts are used. No raking or scraping action is employed. The Jeffery principle of aeration is embodied in the design. The weight is approximately 1100 lb.



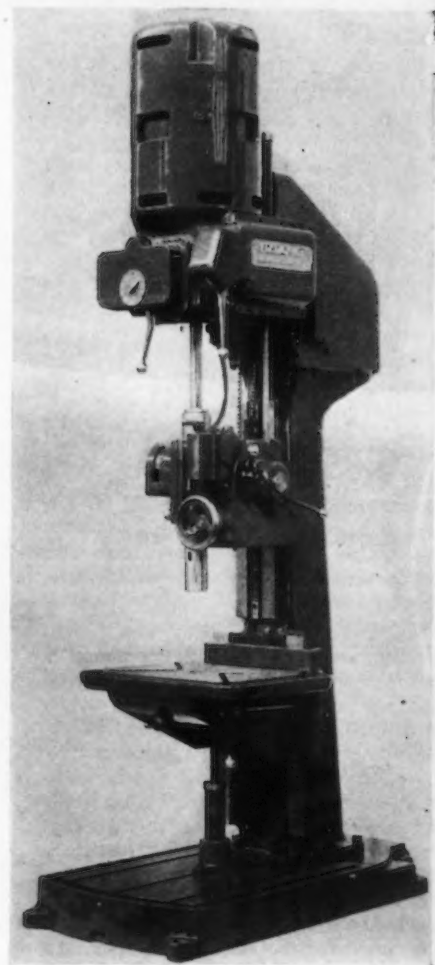
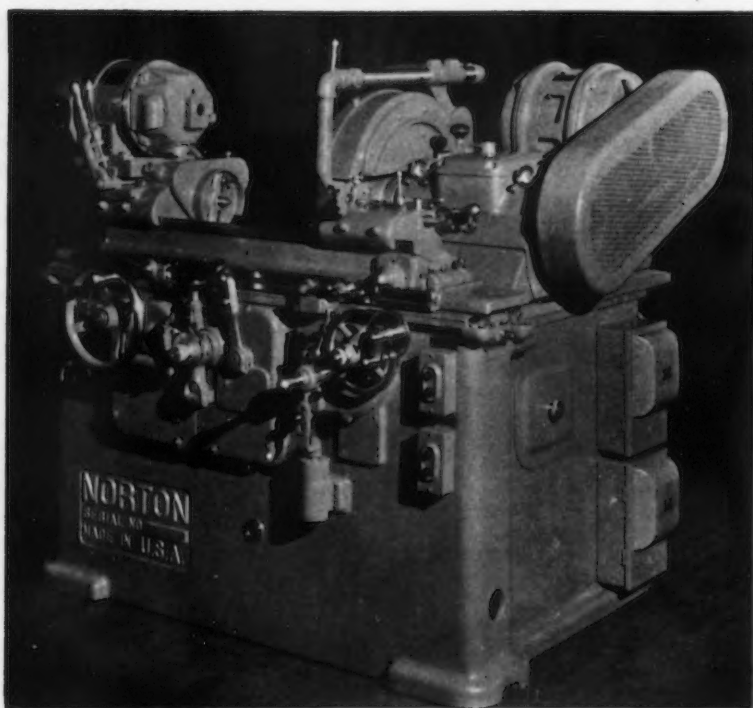
AT RIGHT

THE Fosdick Machine Tool Co., offers both round and box column type machines in these new upright drills which are described in detail on page 35.



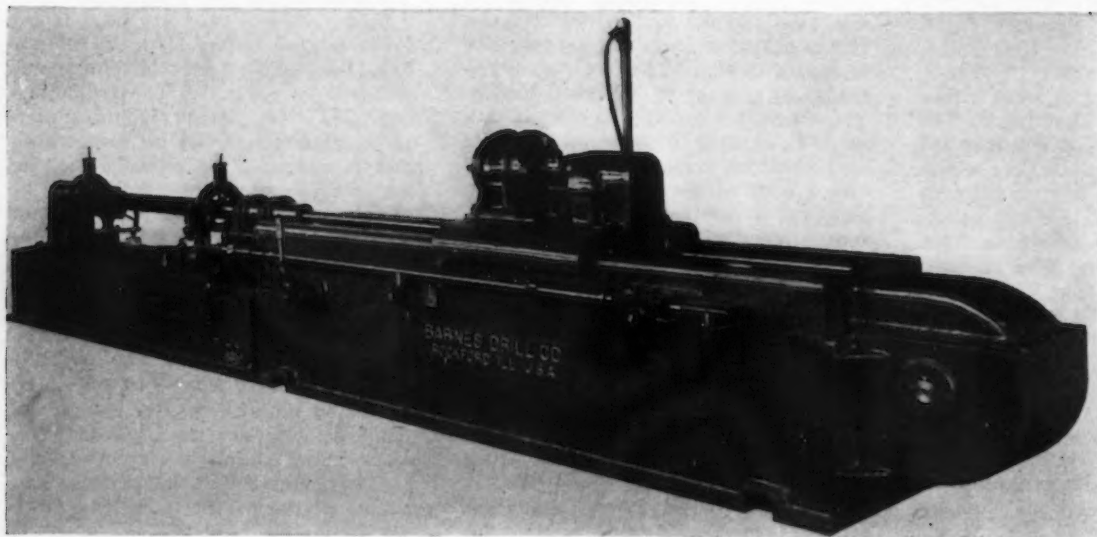
BELOW

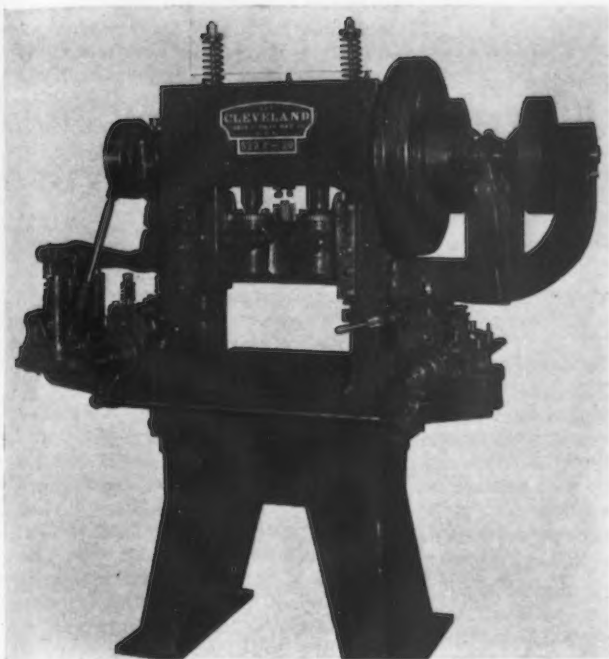
GRINDING machine experience has been a factor in the design improvements which feature this new member of Norton's type C line of grinders. The machine is described on page 35.



AT LEFT

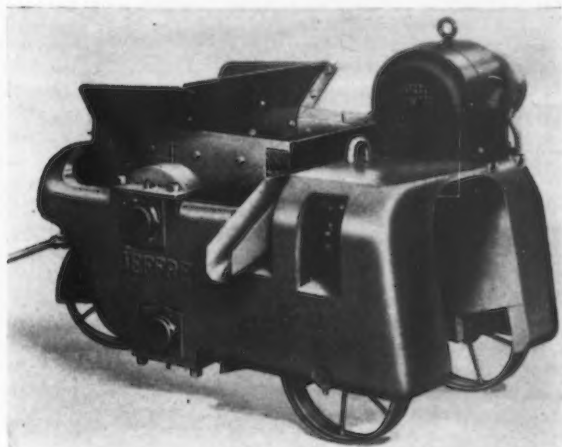
A HORIZONTAL honing machine, using a fluid motor for hydraulic impulse action, has been built to cover both length and size ranges of work for which vertical honing is not practical as a manufacturing operation. Features of design are given on page 38.





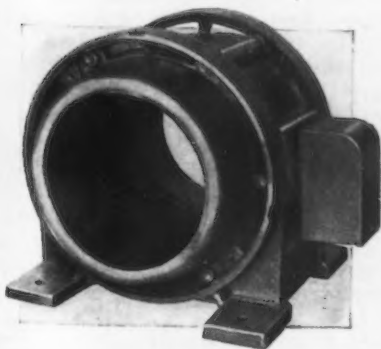
ABOVE

THIS high-speed, double eccentric, all-welded press, a product of the Cleveland Punch & Shear Works Co., Cleveland, has an operating speed up to 250 r.p.m. It is V-belt driven, equipped with friction clutch and brake, and has double roll feed and scrap cutter. The slide is provided with die setting adjustment. Capacity range is said to be wide.



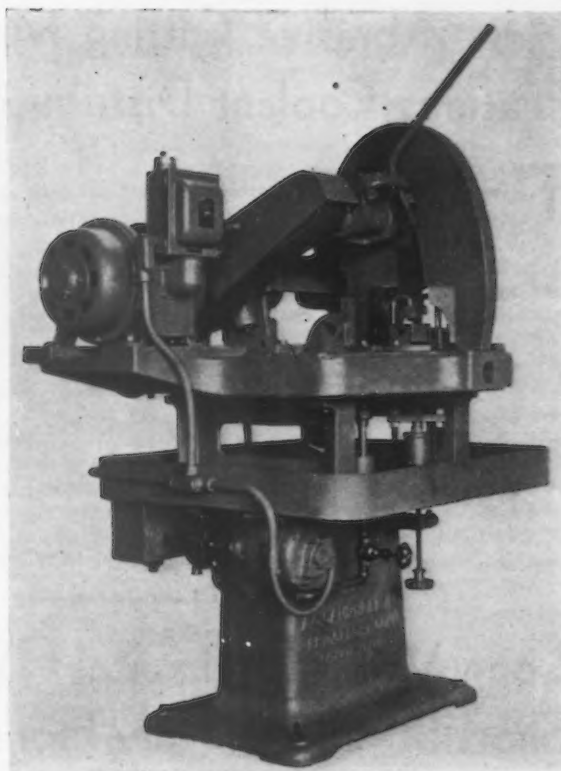
ABOVE

A PORTABLE sand reconditioner, referred to on page 35, is said to segregate all refuse and to pile the reconditioned sand in a convenient manner. The equipment is offered for use in any foundry work which requires sand attention.



AT LEFT

"SEAL-CLAD" squirrel cage motors, introduced by the Allis-Chalmers Mfg. Co., Milwaukee, are of open type with hard, smooth Bakelite shields sealed over the stator coils for protection against foreign matter which may be injurious to insulation. Cast steel frames, twistless stators, silver-brazed rotors and anti-friction bearings feature the specifications.

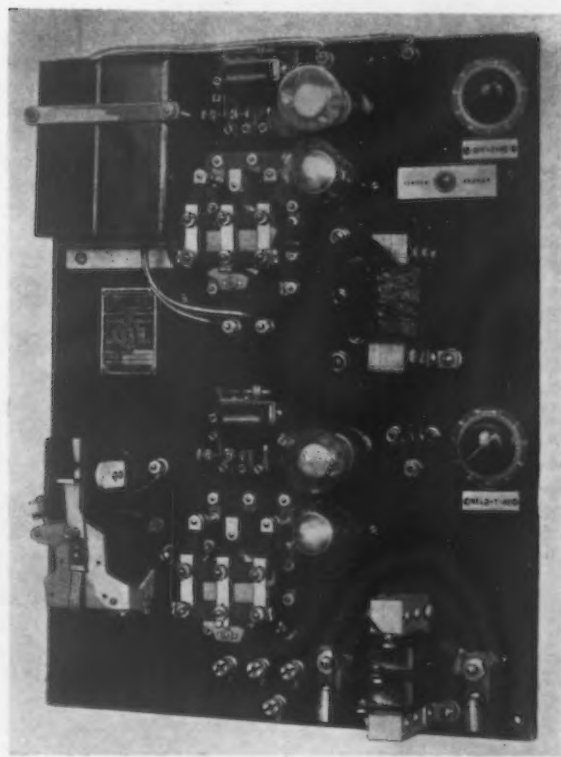


ABOVE

NEW, motor-driven equipment for metal parting with abrasive disk is outlined on page 38. The manner of coolant distribution is said to assure an equal distribution on each side of the disk.

BELOW

A WELD timer designed to permit variation from a standardized allotment of time for work-positioning is announced by the Electric Controller & Mfg. Co., Cleveland, and is described on page 38.



New Abrasive Cutting Machine Features Coolant Distribution

THE method used in applying liquid coolant in wet abrasive cutting is said by the Andrew C. Campbell Division of the American Chain Co., Bridgeport, Conn., to feature two new models of abrasive cutting machines which have been recently added to its line. A portion of the abrasive wheel passes through water overflowing from a standpipe. The passage is at 90 deg. to the point of cutting and permits the wheel, by its own speed, to pick up the proper amount of coolant on both sides of the disk and direct it against and into the cut being made. It is said that this design assures a continuous

and uniform quantity of liquid coolant over each side of the disk.

The machine is designed for cutting alloy steels, non-ferrous alloys, plastics and many other materials in solid bar up to 3 in. in diameter and has tubing capacity up to 3½-in. diameter. The stroke can be varied. Model No. 202 has a foot-treadle operated clamp. Model 203 employs an automatic, electrically operated clamp. Both models are mounted on pedestal bases and all moving parts are protected. A 16-in. wheel is used. A 7½-hp. motor is required. The weight is 1635 lb. The equipment is pictured on page 37.

Long Work Horizontal Honing Machine Short Strokes at Any Hone-Travel Point

THE horizontally operated honing machine, pictured on page 36, is a product of the Barnes Drill Co., Rockford, Ill., and has been designed for work of such lengths or sizes as prohibit vertical honing as a regular shop operation. The method of reciprocating the carriage, upon which are mounted both the spindle and the motor, is stressed by the makers as being of considerable importance. It is said that the fluid motor used, but which does not show in the cut, gives the full hydraulic influence of a hydraulic cylinder and that its use permits of a shorter main bed than would be possible by design embodying cylinder power. One lever, at the operator's mid-length station, controls both the start and stopping of the rotation and of the reciprocation of the spindle. Important auxiliary means is provided for short-stroking at any point in the spindle travel; this provision simplifies the removal of stubborn taper or high spots. The No. 5 machine shown is for bores up to 5 in. in iron or steel and has 6-ft. spindle travel; other travel capacities are available. The outer work-supporting bed houses the coolant reservoir which, for filtration purposes, has been given large capacity. The method of filtration can be described as follows: The overflow is carried through oil channels to the front of the work-supporting bed, where it is cascaded into the settling tank. The coolant feed is featured by an anti-splash guard through which it passes, from the rear end of tubing, to receive the prescribed overflow treatment. Built in three sizes, these machines are more or less subject to modifications to meet the peculiar requirements of the class of work to be honed. Spin-

dle rotations and reciprocations are determined by the nature of the work. Take-off gears provide for speed changes. Volume control is said to give wide range and rate of stroking.

Old Charcoal Furnace May Be Restored

THE Ohio State Archaeological and Historical Society is considering the restoration of one of the old charcoal iron furnaces in the Hanging Rock region of southern Ohio. It is the society's intention not only to reconstruct the furnace in every detail, but also to rebuild the log church and school found in all the early settlements, as well as the store, blacksmith shop and cabins which made up the community.

The Jefferson Iron Co., in Jackson County, near Oak Hill, Ohio, which was the last to operate a charcoal furnace in the region, has offered to give its land to the State, including the old furnace stock, timber, cabins, etc. The site is an excellent one for a park or forest reserve.

The charcoal iron furnaces in the Hanging Rock region played an important part in the industrial life of Ohio as well as of the entire country. Seventy-two such stacks were erected in the region embracing parts of West Virginia and Kentucky as well as southern Ohio, and, in 1880, 16 furnaces were in operation in Jackson County alone.

"Old Jefferson," one of the most successful of the group, was built in 1854 by a group of Welsh pioneers, the descendants of whom have long been active in the ownership and

management of the Globe Iron Co., Jackson, Ohio, well known maker of silvery iron. The Jefferson stack last operated in January, 1917. An unusual tradition of the furnace was the fact that it never operated on Sunday. It was written into the company's constitution that no wheel should be turned on the Lord's day.

D. M. Jones, Oak Hill, is chairman of a citizens' committee which is actively promoting the project.

Timer Provides Variable Positioning Period

AN automatic repeat weld timer by the Electric Controller & Mfg. Co., Cleveland, shown on page 37, features the fact that its additional timing circuit, over that of the company's standard automatic weld timer, provides a control, which in addition to assuring the correct number of heat units for each weld, gives definite time adjustability to cover the length of time ("off-time") the electrodes shall remain apart for the positioning of work. This feature of adjustability, it is said, has sufficient practical sensitiveness to provide that as a "green" operator progresses in the development of his work-handling technique, the open electrodes time can be gradually reduced in the same proportion that the operator's efficiency increases.

The illustration shows the equipment removed from its dust-proof cabinet. At the right of the panel are the adjusting dials for off-time and weld-time. Below the off-time dial is a small, double throw, snap-switch which permits either automatic repeat operation or single shot operation of a temporary nature.

French Book on Structural Welding

ABOOK on arc welding of structural steel has been published by L'Office Technique pour l'Utilization de l'Acier, 25 Rue du General Foy, Paris, France. It is a comprehensive publication, covering the recent practice in all countries. The text matter is grouped in three parts. Part I, devoted to the general principles of welding, comprises 13 chapters and discusses equipment, rules, and the general basis of design, among other things. Part II, in 11 chapters, details examples of welded joints, while Part III, in 50 pages, takes up gas cutting, both by hand and by machine.

The publishing organization, known as O U T A, corresponds in a measure to the American Institute of Steel Construction. In August, 1933, it issued a volume on arc welding as applied to any field of industry. The present volume, designated as Volume II, is restricted to arc welding as applied to structural steel.

Great Britain's Experience With Unemployment Insurance Outlined by Conference Board

THE National Industrial Conference Board, New York, has announced the results of an investigation of British experience with unemployment insurance. The study covers the period from 1911, the date of the first unemployment insurance act in Great Britain, to June 28, 1934, when the Unemployment Act of 1934 received the Royal assent. The findings have been issued in a 40-page pamphlet entitled "Unemployment Insurance: Lessons from British Experience."

The chief lessons from British experience, as summarized by the board, are as follows:

(1) Unemployment insurance is not a remedy for depressional unemployment.

(2) Seasonal and casual unemployment, tends to become permanent as a result of statutory unemployment relief.

(3) Chronic unemployment, due to permanent loss of trade, must be dealt with by other measures than unemployment insurance.

(4) Without an efficient and honest administrative force, unemployment insurance has no chance of success.

(5) Any scheme of unemployment insurance must be accompanied by a plan of unemployment relief for the workers who lose their right to insurance benefits or who cannot qualify for the receipt of benefit and for workers in uninsured occupations.

(6) If unemployment insurance is not supplemented by a scheme of relief, the temptation to extend statutory benefits to persons who are not qualified under the law is irresistible, making it impossible to avoid political raids on the unemployment fund until the state of national finances becomes so critical as to threaten the solvency of the nation.

(7) If unemployment insurance is uniformly applied to all types of unemployment, it impairs the elasticity of the economic system.

(8) If unemployment insurance is not based on an accurate knowledge of the facts of unemployment, it will be abused both by workers and by employers.

Reliable Information Lacking Here

The board's report points out that in the United States reliable information concerning the extent and nature of unemployment is almost totally lacking. It suggests that before any compulsory scheme of unemployment relief is adopted it would be desirable to establish, under Government auspices, a fact-finding body, composed of representatives of labor, industry, state and local governments, and the general public. The task of this body would be to make a thor-

ough survey of the facts of unemployment, its nature and extent, to hold hearings and accept testimony from interested groups and persons throughout the United States, to give wide publicity to its findings, and to make recommendations for action by industry and by the legislatures. The results of such a survey would be of inestimable value in acquainting public opinion and the public representatives with the problems that arise in connection with an attempt to provide security against unemployment.

The British Unemployment Insurance Fund began with an initial coverage of 2,250,000, but in 1916 this was increased to 3,750,000 and by the Act of 1920 the number of insured persons was raised to almost 12,000,000.

In each of the first eight years of the fund's existence, its receipts exceeded expenses and on Nov. 7, 1920, the fund had a surplus of £21,800,000 sterling. The extension of the insurance scheme occurred during a business depression. By the end of July, 1921, the surplus of the fund was exhausted and a deficit began to accumulate. During the fiscal year ended June 30, 1922, the fund incurred a deficit of £15,500,000, and by March 31, 1934, the total debt of the fund was £115,000,000.

When the fund was started, the rate of benefit was fixed by 7s. per week for adult workers; in 1919 the rate was 11s., and after 1931, 15s. 3d. The fund was built up by contributions as follows: employers, 2½d. per worker per week; employed workers, each, 2½d. per week; the state, 1 2/3d. per employed worker per week. After Oct. 4, 1931, these payments per week per employed worker were 10d. each from employers, workers, and the state.

On March 19, 1934, there were 1,796,787 unemployed persons on the registers of employment exchanges. Of this number, 1,666,083 persons were in occupations insured against unemployment. Of those in insured occupations, 534,357 persons, or 32 per cent, were in receipt of insurance benefit; 927,167 persons, or 56 per cent, were receiving transitional payments; and 205,558 persons, or 12 per cent, were receiving no relief of any kind from the unemployment fund.

Contributions to the unemployment fund showed a striking decline during the depression years. In 1927-1928 the contributions accounted for 72 per cent of all expenditures. In the next two years the insured and their employers paid about 56 per cent of the total cost. The contributions of employers and employees accounted for only 29 per cent of the cost in 1930-1931; 27 per cent in 1931-1932; 32 per cent in 1932-1933; and 39 per cent in 1933-1934. Over the entire period from 1921-1922 to 1933-1934 the employers and employees contributed less than half of the total payments made by the unemployment fund.

Germany Exceeding Tube and Rail Cartel Quotas—Barter Agreements Help

HAMBURG, Nov. 20. (By Special Correspondence). — The German steel tube industry reports an increase in exports this year of 37 per cent as compared with the corresponding 1933 period, and has exceeded its allotment in the International Tube Cartel, which expires next year. The German industry is therefore threatening to withdraw from the cartel unless its allotment is increased. The barter organization established by the cartel has recently brought more orders to the German industry and foreign buyers have taken proportionally more German tubes than in the years before.

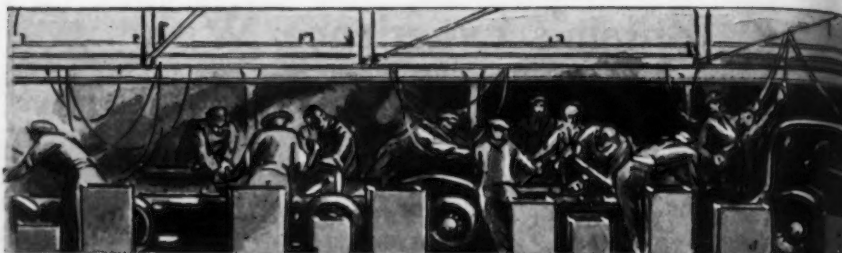
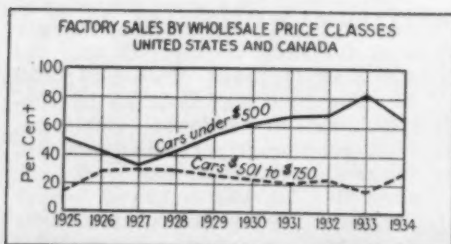
The same situation applies to rails. Germany has exceeded her allotment in the International Rail Makers' Association, of which the United States is a member. Germany exported 28,700 tons of rails during the first nine months of 1932, 52,100 tons in the corresponding 1933 period and 82,800 tons in first nine months of this

year. Whereas not a ton was traded on barter in 1932, 1700 tons was so sold in 1933 and 38,600 tons this year. Of the latter total 9000 tons went to Turkey, 10,000 tons to Argentina and 6000 tons to South Africa. Barter opportunities are still large as the largest buyers are the different State railroads abroad and the governments owing the railroads can secure directly import allotments in Germany for their countries' products.

Steel Demand Sustained

Satisfactory demand continues in the German market, although at this time of the year business is usually dull. While the domestic market is particularly active, exports are also much better than last year. The German steel industry's share in world production during the first nine months of 1932 was 8.9 per cent, in 1933, 10.9 per cent, and this year it has been 13.3 per cent.

(Concluded on Page 72)



THIS WEEK ON THE

Volume Production to Be Reached Slowly In Automobile Industry

DETROIT, Nov. 27.

DESPITE the bustle of activity in the Detroit district, steady expansion in employment and the ambitious plans of the automobile industry for 1935, volume production is several weeks off. Output the last two weeks has been about as low as it could go without total suspension of operations. Improvement in the next 30 days will be substantial, but will not come with the rush that some people had anticipated.

With all the optimism that has radiated from Detroit in recent weeks, it is rather disconcerting to learn that the number of families on relief rolls in Wayne County is higher today than in April, 1933, the previous peak month. On the other hand, there were 40,000 more workers employed in Detroit on Nov. 1 than on the same date a year ago and 30,000 more than at the corresponding time in 1932 and 1931. Payrolls are increasing daily, and by Jan. 15 or Feb. 1 it is expected that every experienced automobile worker will have a job again.

Ford is not turning around as fast from the old model to the new as Dearborn officials had hoped for. As is usual in the initial production period, the number of finished motors coming off the line varies sharply from day to day. The highest single day's assembly of motors thus far is said to have been around 1500. Assemblies of cars should get under way this week. The change-over at Rouge is reported not yet sufficiently far along that definite production schedules have been set up. There is just one main objective—to turn out as many motor cars as possible in the next 60 days.

It is seldom that Ford has waited to announce a new car until his dealers are stocked. That the announcement date is not far off is indicated

by removal of the few remaining 1934 cars from Ford's large show-rooms at Highland Park and the covering of the massive windows so that no passer-by can get even a peep at what is behind them. General opinion puts the debut of the 1935 V-eight from Dec. 8 to 15. While the various features of the new car are of interest to the trade, competitors are mainly concerned about the price. They are worried for fear that Mr. Ford may decide to knock off \$25 from present list prices, or perhaps even more. If he keeps his car at today's level, Chevrolet and Plymouth will breathe sighs of relief. Meanwhile they are fretting nervously as they wait for the exasperating chief citizen of Dearborn to reveal his hand.

Dodge and Plymouth both have new cars coming off the assembly lines and should be in a position to announce early in December. However, they have decided on a late December or early January showing, unless they suddenly change their minds. A desire to find out what price tag the new Ford will have seems to be the only logical explanation for this delay. Both companies are exerting pressure to push production up to higher levels as soon as possible.

Pontiac began operations in a modest way the past week. Hudson is getting started on orders for \$6,500,000 worth of cars to be delivered to dealers and distributors by Dec. 31. Oldsmobile is reported to have a schedule of 5000 cars for December, but even the most optimistic question whether actual assemblies will come within shooting distance of that goal. None of these manufacturers, however, is understood to be planning on public announcements before the latter part of December.

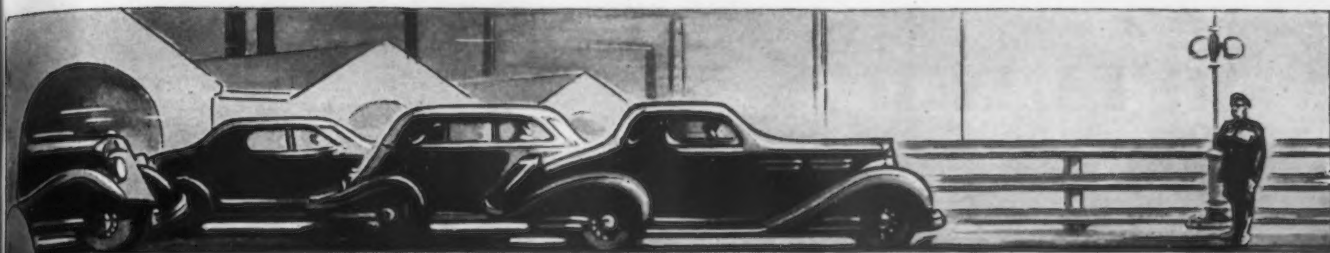
Studebaker apparently is the only company willing to take a chance on

pricing its 1935 series prior to the Ford debut. It is counting on an introduction about Dec. 1. Independent springing, by means of a system designed by Studebaker engineers which utilizes leaf springs, is said to be a feature of the new Studebakers. This springing system, of course, is confined to the front wheels. Styling is reported to be little different from the present series.

Chevrolet still is making 1934 Standard cars and trucks. There has been no tooling program for the Standard job and it is believed, therefore, that Chevrolet is going into 1935 with no consequential changes on this line. It will be recalled that the Standard first was introduced in the spring of 1933 and no change was made in its design until last April. From past performance it is reasonable to expect a new Standard car next spring.

It will be about Jan. 1 before the new Master Chevrolets are in production. The announcement will be made early in January, according to reliable reports. The local gear and axle and forge plants are down until early in December, when they will begin to make parts for the 1935 Master cars. It is understood that some of Chevrolet's bumpers the coming year will be fabricated outside. For several years they have been furnished exclusively by Chevrolet's local bumper plant.

Packard's offices are among the busiest in the industry as plans go forward for the new light car. Reports have been circulated in the East to the effect that the new Packard will be powered by a Diesel motor. This report is positively denied by the management. In fact, those familiar with the status of the Diesel engine know that there isn't the faintest possibility that in the next several years



ASSEMBLY LINE

any passenger car will have a Diesel power plant.

Packard Buys Steel

Last week Packard made the biggest steel buy in months. Those who think that this transaction is a forerunner of early production of the new car will be disappointed, because it is improbable that assemblies will begin until February.

That General Motors will retain independent springing, using coil springs on all its cars except the Standard Chevrolet in 1935 seems assured. It is expected that the G.M. car divisions will say that their competitors couldn't afford knee action and abandoned it as a matter of economy. Plymouth and Dodge officials, on the other hand, are said to contend that knee action is highly over-rated and isn't nearly the selling feature that they thought it would be. So the battle is on and will rage through the coming year.

While the influence of the La Salle design can be seen in the new Dodge, it is not so noticeable as in the Plymouth, which is reported to have the half-moon shaped louvers heretofore identified only with the La Salle. Both cars are said to have smoothed out rear-end lines which are in conformity with the trend toward sweeping curves. Neither car, however, is of radical appearance.

Trend Toward Built-in Trunks

The trend in car design is toward complete elimination of separate trunks on touring models in favor of built-in trunks which are more pleasing to the eye. These trunks will not be of small capacity, but will extend far forward so that ample room is available for baggage. Some of the compartments will have a lower section for a spare tire to be placed in a horizontal position.

Equipment builders are of the opinion that after new models are introduced and car manufacturers begin to gage their markets for 1935 there is likely to be considerable new equipment bought to secure increased production and lower costs. If such purchases materialize, they should stimulate the machine tool business in late January and in February.

By **BURNHAM FINNEY**
Detroit Editor, **THE IRON AGE**

Although Citroen has asked for quotations on American equipment in connection with the manufacture of the Spicer universal joints and shock absorbers at its Paris works, it probably will not place any orders in the United States at this time. Citroen invested several million dollars in American tools about a year ago in preparing its plants for production of its front-drive car, which has been the sensation of the year on the Continent. It is probable, therefore, that Citroen will draw on its present stocks of machinery to meet current demands, especially in view of the fact that France today is feeling the depression in the same degree that the United States felt it two years ago.

Hupp-Citroen Deal Off

The proposed deal whereby Hupp-mobile might build the Citroen front-drive car in this country is definitely off, according to unauthoritative but reliable advices. Archie M. Andrews, chairman of Hupp's board, and André Citroen are said to have been unable to agree on satisfactory terms and consequently negotiations were abandoned.

The Stout Motor Car Corp., organized early this year, will soon go into limited production of a rear-engined, light-weight car made mostly of aluminum alloys. The car has been designed by William B. Stout, president-elect of the Society of Automotive Engineers and creator of airplanes and streamlined trains. No longer than a Ford or Chevrolet and no heavier, the new car is understood to have swivel chairs arranged so that occupants may gather about a table and play bridge while the car is being driven 50 miles an hr. The car also is said to have independent springing on all four wheels, coil springs of the Buick type being used. Front-end appearance is reported to resemble that of the new streamlined trains. The fact is not yet established whether the car will be air-condition-

ed. However, it is known that consideration has been given to the system designed by McCord Radiator & Mfg. Co. whereby the propane fuel employed to condition the air also is utilized to operate the motor.

Incidentally, propane is being successfully put to work in a dual role for operation of motor trucks, such as those transporting meats and other perishable foods for which a refrigerant is needed. The propane performs a service as a refrigerant and then passes through pipes to the front of the truck where it furnishes the power for the engine. It is being carried in small tanks by service stations. These tanks can be exchanged when the supply is exhausted as rapidly as the average motorist can have his tank filled with gasoline.

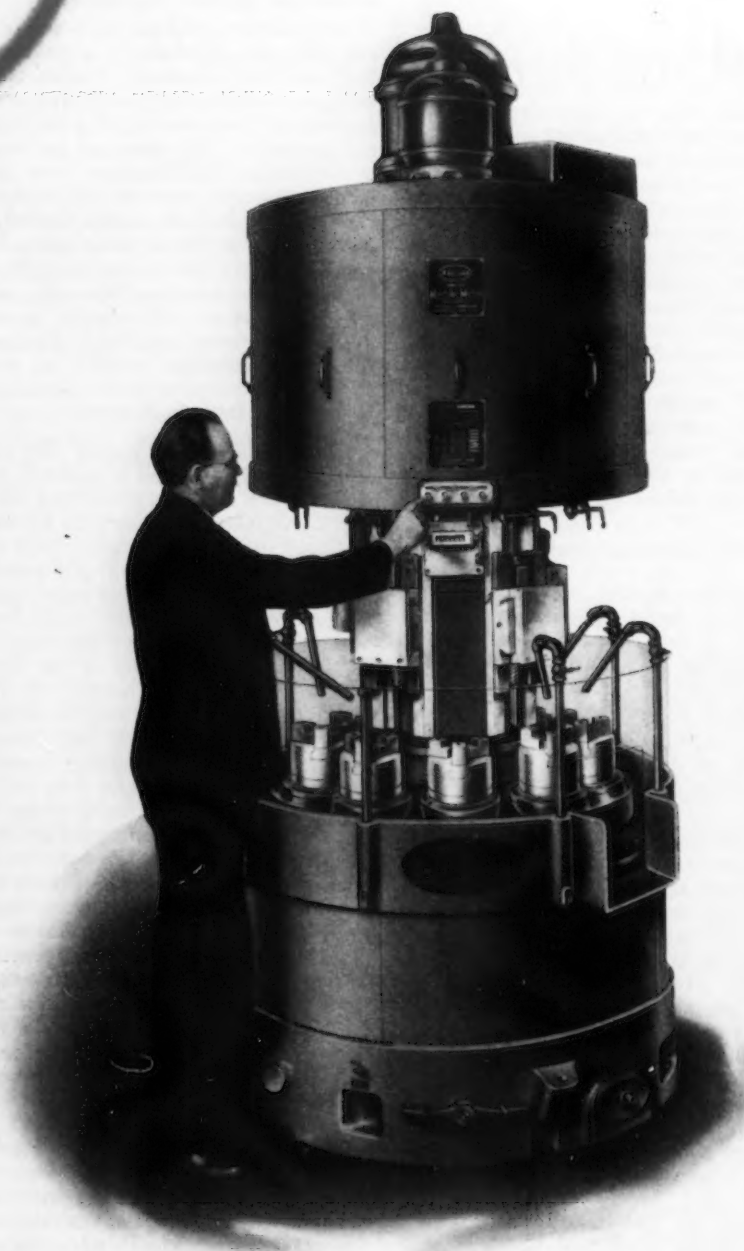
Detroit Notes

Oldsmobile is not buying any new machine tools or press equipment. The recent story about expenditures totaling \$2,500,000 was an account of what has been done in the way of improvements over the last five or six months. . . . Ford is to rebuild the huge, gear-shaped rotunda of the main Ford building at the Century of Progress as the visitors' entrance to the River Rouge plant at Dearborn. . . . One of the General Motors units is to have as standard equipment the coming year connecting rod bearings made of an alloy of cadmium and pure silver. The silver content is said to be one per cent and cadmium approximately 97 per cent. . . . Ford is soon to reopen assembly plants at St. Louis and Long Beach, Cal., which were closed early in 1933. . . . General Motors today is getting the largest percentage of business in overseas markets in its history. . . . Plymouth dealers sold \$228,660,669 worth of cars in the first 10 months of this year. Plymouth now has 11,635 dealers. . . . Ford is pouring heats from only two out of nine open-hearth furnaces, although two other furnaces are being kept warm. A dearth of scrap and unwillingness to pay the market price for scrap are said to be responsible for the low operating rate. Plenty of scrap will be available when the Rouge plant is back on a good schedule and the body suppliers of Ford again are in volume production.

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THE NEWS OF THE WEEK

British Iron and Steel Demand Steady—Tin Plate Heavily Booked

LONDON, ENGLAND, Nov. 26 (By Cable).—Pig iron is strong with active prompt and forward buying and steady withdrawals from stocks. Higher prices are being demanded for export. A brisk home demand for hematite is reported and heavy shipments are going to Italy.

Demand for semi-finished steel is steady and good order books are reported. Further big bookings are expected next month. Little fresh business is going abroad. Prospects for finished steel are bright and a sudden

flow of shipbuilding contracts has occurred. Large rail orders have been booked from South Africa and Peru and other exports are expanding.

Brisk home business in tin plate is developing and some consumers have bought eight months ahead. Exports are quiet.

Continental iron and steel are inactive except in the case of billets.

Business with the United Kingdom is affected by the possibility of an English tariff increase. The Far Eastern markets are dull with American and Polish competition keen. Syria has ordered 2000 tons of sheets and Portugal has taken 11,000 tons. The recent International Raw Steel Cartel meetings merely concerned current business and organization of foreign markets. Japan is negotiating with the Indian Tata works for delivery next year of 250,000 tons of Indian pig iron.

Russian purchases in Czechoslovakia totaling 100,000,000 kroner worth of boilers and steel sheets are being negotiated.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton	
Ferromanganese, export	\$9
Billets, open-brth.	\$5 10s. to \$5 15s.
Tin plate, per base box	*18s. 2d.
Steel bars, open-hearth	\$7 17½s.
Beams, open-brth.	\$7 7½s.
Channels, open-hearth	\$7 12½s.
Angles, open-hearth	\$7 7½s.
Black sheets, No. 24 gage	\$9 5s.
Galvanized sheets, No. 24 gage	\$11 5s.

*To March 1; 18s. 5d. thereafter.

Official Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £	
Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange	
Billets, Thomas	\$2 7s.
Wire rods, No. 5	
B.W.G.	\$4 10s.
Steel bars, merchant	\$3 5s.
Sheet bars	\$2 8s.
Plate, ¼ in. and up	\$4
Plate, 3/16 in. and 5 mm.	\$4 2s. 6d.
Sheets, ¼ in.	\$4 7s. 6d.
Beams, Thomas	\$3 2s. 6d.
Angles (Basic)	\$3 2s. 6d.
Hoops and strip base	\$4 2s. 6d.
Wire, plain, No. 8	\$5 7s. 6d.
Wire nails	\$5 15s.
Wire, barbed, 4-pt. No. 10 B.W.G.	\$3 15s.

President Alone Can Prevent Final Rejection of Steel Truce

A RIFT between William Green and Michael Tighe apparently is the one and only obstacle to a capital-labor truce in the iron and steel industry. In line with the President's appeal for an industrial armistice the leading companies in the steel industry offered to recognize union leaders in their official capacity without, however, agreeing to a closed shop. In other words, the industry was willing to deal with union officers as representatives of union members but reserved the right to deal with others representing non-union groups. This proposal was reported as agreeable to the Amalgamated Association of Iron, Steel and Tin Workers, but was rejected, it is stated, on the insistence of Mr. Green.

The head of the American Federation of Labor may have felt that acceptance of the truce offer would be inconsistent with the militant program authorized at the San Francisco convention. In that meeting the Amalgamated association was roundly condemned for its lack of aggressiveness (in the union election of Sept. 15 only 6500 votes were cast, as compared to a payroll of some 400,000 in the industry) and the organization of a new and separate vertical union in

iron and steel plants was authorized.

But whatever the reasons for dissension among the leaders of organized labor, such a development cannot be welcome to an Administration which is bending its efforts, as never before, to bring about concord and collaboration among all economic groups in a united drive to stimulate business revival. Washington's emphasis on conciliation and peace may well come from a realization that there may not be another opportunity to bring about normal business recovery before the next Presidential election. The pressure that may be exerted on organized labor leaders to conform to the new policy of team work may therefore be in proportion to the danger of a major breach of industrial peace at this time. If the President can "persuade" Mr. Green to withdraw from the negotiations and permit the Amalgamated association to make its own decision as to the terms offered, the projected truce may yet be concluded. However, unless action is taken soon the offer made by the steel industry may be withdrawn. There is already a feeling in some quarters that too much has been conceded in view of the manifest weakness of the Amalga-

mated union among iron and steel employees.

Certain it is that if the truce that has been tendered is definitely and finally rejected, further efforts of the National Steel Labor Relations Board to intervene in the labor relations of the steel industry will be fought to the last court. At the present time the board is taking evidence on the interstate character of the Carnegie Steel Co.'s business with its bearing on petitions for elections at the Duquesne and MacDonald plants. The company contends that manufacturing operations are intrastate and have always been so held to be by the courts. It is inconceivable, however, that the board would so decide, because by so doing it would admit that it was without jurisdiction over any labor dispute. The company, however, is free to carry the matter to the courts because it has never recognized the board's jurisdiction, although agreeing to attend its hearings. It has thus preserved its constitutional rights. On the other hand, the employee representative organizations at the Duquesne and MacDonald plants have recognized the jurisdiction of the board and have retained attorneys to protect their interests. In the event that the board should call for elections at these plants the representative organizations would no doubt appeal to the district courts for a review of the order. Meanwhile the company would be free to institute injunction proceedings on the ground of lack of jurisdiction.

Structural Steel Shipments Higher

Shipments of fabricated structural steel in October amounting to 94,215 tons were the largest for any month this year, according to reports received by the American Institute of Steel Construction. They were 62 per cent larger than the monthly average of 61,956 tons in the first half of the year and 38 per cent ahead of the 73,139 tons shipped in the same month last year.

On the other hand, there was recorded a seasonal decline in the bookings which seems rather marked in contrast with the bulge in new business experienced by the industry during the spring months. The bookings during October, at 50,070 tons, were 28 per cent below the average for the previous nine months, but approximately equal to the bookings during this same month in 1933. The October bookings were 5 per cent larger than those of September. The industry's backlog of 259,202 tons is about 11 per cent below the backlog this time last year.

These estimates are based upon reports received from shops representing 80 per cent of the industry.

American Steel Warehouse Association Completes Reorganization Plans

AT a special reorganization meeting of the American Steel Warehouse Association held at Hotel Cleveland, Cleveland, Nov. 21, plans for incorporating the membership under the laws of New York State were completed. Incorporation details will be carried forward immediately and the style of the association will be changed to the American Steel Warehouse Association, Inc. Principal offices of the organization will be maintained at 442 Terminal Tower, Cleveland, under the direction of Walter S. Doxsey, executive secretary.

Action at this meeting followed a seven-week campaign to bring the reorganization plans before virtually all members of the association. Officers of the organization visited local chapters from coast to coast within this period to explain the new methods of government which will become effective upon the incorporation of the association.

The new constitution and by-laws that then become operative provide for control of association activities through directors representing the local groups, each of which will have one director on the national board. In addition to these directors, nine directors-at-large are provided under the new constitution. Officers of the association will be elected by the directors, the officers comprising the executive committee which will direct the work of the organization in the intervals between the directors' meetings.

Chapter Locations

Chapters of the association have been established as follows: New England, Connecticut, New York, Philadelphia, Baltimore, Pittsburgh, Cleveland, Buffalo, Detroit, Chicago, Milwaukee, St. Louis, Twin Cities, Cincinnati, Portland, Seattle, Los Angeles, and San Francisco. The increase in the total membership to approximately 250 at the time of incorporation will be about 100 per cent of the Oct. 1 total.

The membership at this meeting, by unanimous vote, expressed confidence in the present officers and recommended to the directors that they be continued in office until the annual meeting to be held next May. These officers are: president, H. B. Ressler, vice-president, Joseph T. Ryerson & Son, Inc., Jersey City; first vice-president, Lester Brion, president, Peter A. Frasse Co., New York, and second vice-president, J. F. Rogers, Beals, McCarthy & Rogers, Buffalo. Directors-at-large, elected in addition to Messrs. Ressler, Brion and Rogers, are: C. C. Dodge, Geo. F. Blake Co., Worcester, Mass.; A. C. Castle, A. M.

Castle & Co., Chicago; Charles Heggie, Scully Steel Products Co., Chicago; E. L. Parker, Edgar T. Ward's Sons Co., Pittsburgh; Ralph J. Stayman, Jones & Laughlin Steel Corp., Pittsburgh, and J. J. Hill, Jr., Hill-Chase Co., Philadelphia.

Agricultural Section Of S.A.E. to Meet

TRACTOR, agricultural and industrial-power specialists will meet in Chicago, Dec. 5 and 6 to participate in a program arranged by the tractor and industrial-power equipment committee of the Society of Automotive Engineers. All the sessions of the December meeting will hear papers based on the subject of wear factors in engine design and operation. Among the engine components to be treated from this point of view, are cylinders, pistons, air-cleaners, and valves and valve-gears. One of the four sessions will cover the influence of lubrication on the problem of engine wear, particularly in cold starting. Another will be devoted to Diesel engines.

Large Steel Tonnage In FHA Program

MODERNIZATION activities spurred by the Federal Housing Administration are awakening long sleeping markets for building supplies and equipment, much of which uses iron or steel, according to the American Iron and Steel Institute.

Even though the iron and steel required by a single modernizing job may be measured better by the pound than by the ton, the institute estimates that the aggregate tonnage of products needed to modernize thousands of dwellings, apartment houses, farm buildings and factories will be important.

Authorities predict that \$1,500,000,000 will be spent within two years to modernize buildings, and they say further that this sum will cover only 20 per cent of the country's known requirements for all kinds of housing repairs. In the first 60 days of the Government's campaign, \$50,000,000 was loaned for repairing and modernizing homes, farms, apartments and all kinds of business buildings. About \$14,500,000 of this is estimated to be needed for material, while \$35,500,000 will go for labor.



A. F. of L. Prepares to Fight the Steel Industry

*Truce Plans Reported to Have Been Squelched by William Green
Who Also Objects to Richberg's Ideas on Section 7-A*

WASHINGTON, Nov. 27.—The definite break in the plans for reaching a truce between the steel industry and the Amalgamated Association of Iron, Steel and Tin Workers is understood here to have been caused by William Green, president of the American Federation of Labor. Lacking confirmation but apparently coming from well-informed sources, it is reported that the amalgamated leaders were agreeable to the industry's offer to deal with union officials though refusing to sign contracts with the association or to deny to non-union employees the right of their own representation.

The attitude of the federation is understood to have been plainly stated by Mr. Green in his recent conference in Washington with President M. F. Tighe of the association. In any event Mr. Green stated after the conference that the federation proposed to stand by the ruling of the National Labor Relations Board in the Houde Engineering Corp'n. case.

In this case, which Chairman Francis Biddle of the board has succeeded in finally getting the Department of Justice to prosecute, it was held that if a majority of the employees in a given plant vote for collective bargaining the union represented by the majority can speak for all of the employees of the plant. The ruling, however, protected the right of minorities to present grievances, to confer with their employers, etc., a principle laid down by President Roosevelt in his executive order setting up the National Steel Labor Relations Board.

The steel industry's proposal, which is construed as a proportional representation plan, is held to be in keeping with the principle laid down by the President in setting up the steel

By L. W. MOFFETT
Resident Washington Editor, THE IRON AGE

labor board, and to a degree, with that of the National Automobile Board. But President Green affected to see in the steel industry's proposal alleged qualifying provisions by which company unions might gain the upper hand in collective bargaining even where the outside union constituted the majority.

Amalgamated association officials are said not to have agreed with President Green but inasmuch as the association no longer is exclusively an organization of highly skilled workers but has been converted into a vertical union it seems to have ceased to run its own affairs. Instead it has come under the domination of the parent organization, non-favorable to the vertical as against the craft union. There are, however, vertical unions affiliated with the federation which see to it that there is no "outside" interference by the federation. Notable among them are the United Mine Workers of America and the United Textile Workers' Union.

Rift with Federation?

There has been a question raised as to whether or not there might develop a rift between President Green and Amalgamated officials in guiding the steel union's destinies. Certain it is that Mr. Green is encountering conflicts within high ranks which have been altogether favorable to organized labor. Even in high quarters a break has come about for Mr. Green has come out with an attack on Donald

R. Richberg, a former counsel for railroad unions and President Roosevelt's close adviser, for Mr. Richberg's interpretation of Section 7-a, the collective bargaining provision of the National Industrial Recovery Act. By some a break with Mr. Richberg is looked upon as a break with the Roosevelt Administration itself.

In his present position regarding the steel situation, it is believed here that Mr. Green may force a court case. For it is indicated that the National Steel Labor Relations Board will have to act on delayed decisions regarding elections at steel plants. The ones most immediately concerned affect the plants of the Carnegie Steel Co. at Duquesne, Pa., and in McDonald, Ohio, where it claimed majority company representation has been previously demonstrated. That early action is contemplated by the board is indicated by its order of last week in the Duquesne and McDonald cases asking the company and the workers to indicate a convenient time for taking evidence on the interstate character of the company's business. This, of course, is merely a formality.

It has been pointed out by the board that since the hearings in Pittsburgh, Oct. 2 and 3, "numerous mediatory efforts have been made to reach an accord and a satisfactory working arrangement between the parties." At the same time the board issued another order bearing upon alleged discrimination by the Republic Steel Corp'n., as the result of union activity at its Warren, Ohio, plant. The order asked for a report by the company and the labor group as to what use, if any, "has been made of the opportunity afforded by the board to adjust the controversy by direct negotiations between the company and the com-

plainant." The board said the order was issued to the end that "decisions may be issued in the cases still unsettled."

Payroll Lists Would Be Needed

Ordering an election by the steel board would mean its supervision of the election which it could do only by getting an accurate list of voters from payrolls. Judge Walter P. Stacy, chairman of the board, has acknowledged that the board does not have the power to subpoena payrolls directly and that refusal of the company to yield payrolls voluntarily left the alternative of seeking a subpoena through the courts. When the Weirton Steel Co. declined to submit its payroll to the former National Labor Board, the American Iron and Steel Institute came to its support, clearly indicating the attitude of the industry against submitting payrolls and the right of the board to compel their submission.

Before the situation reaches court, however, if it threatens to do so, it is reported that President Roosevelt might hold further conferences with steel officials, several of which have been held previously with relation to the proposed truce. Likewise it assumed conferences would be held with American Federation of Labor and Amalgamated officials. It is reported that Administration sources in previous negotiations urged union officials to accept the steel industry's offer, and that except for Mr. Green, who consistently held out against it, it would have been accepted. The Administration spokesmen are understood to have urged that "recognition in principle" is involved in the offer which has been likened to the agreement reached by steel companies with the United Mine Workers of America as it affects captive coal mines.

Green vs. Richberg

Mr. Green's latest holdout has been against the interpretation by Mr. Richberg of Section 7-a, continued source of confusion, befuddlement and strife. Though Mr. Richberg has interpreted the section numerous times, Mr. Green has just come out with the statement that the interpretation is "completely unacceptable" and that it flatly contradicts the decision of the National Labor Relations Board in the Houde case. Mr. Green does not like Mr. Richberg's point that only those actually voting in an election are to be represented by the union chosen, participants being bound to abide by the results, but non-participants not being bound. Impartial students of the section contend that Mr. Richberg's interpretation does not conflict with the decision in the Houde case. Mr. Green insists it does.

"Labor can not and will not accept Richberg's interpretation," Mr. Green declared. "Under his interpretation a corporation can absolutely control the economic destinies of all its workers."

Mr. Green said that proposals being drafted by federation committees to redraft the National Industrial Recovery Act will be submitted to the President and Congressional committees. One primary purpose, he pointed out, is to clarify collective bargaining rights so that conflicting interpretations and controversies may be avoided. He said labor will urge abolition of child labor and continuation

of provisions for fair trade practices. Meanwhile, Chairman Biddle of the National Labor Relations Board has aggressively taken up his work and succeeded in having the Department of Justice take up the Houde case. Heretofore reluctant to do so on the ground that essential evidence was lacking, Attorney General Cummings has asked Mr. Biddle, himself an able lawyer, to draft the bill of complaint.

Improvement in Durable Goods Industries Predicted at MAPI Meet

AFTER hearing numerous talks on the trend of national events, the future of the NRA and advice on how to sell more machinery, the Machinery and Allied Products Institute completed its three-day session in Cincinnati on Nov. 22, by reelecting members of its code authority. It consists of: Leo W. Grothaus, Milwaukee; George H. Houston, Philadelphia; P. C. Brooks, Chicago; Paul C. De Wolf, Providence, R. I.; W. C. Dickerman, New York; Robert E. Freund, Milwaukee; A. M. Mattison, Rockford, Ill.; Denis F. O'Brien, East Orange, N. J.; N. W. Pickering, Ansonia, Conn.; W. S. Shipley, York, Pa.; George P. Torrence, Chicago, and Guy A. Wainwright, Indianapolis.

An informal vote was taken on the question of whether or not manufacturers favored the permanency of NRA. It was said that the vote was about evenly divided and no decision was announced, the question being left to the executive committee.

Public Now Watching Durable Goods

George H. Houston, president, Baldwin Locomotive Works, in emphasizing the point that national recovery depends on a revival of the durable goods industries, said that "the public is coming to recognize these channels of recovery as the only ones holding out possibility of reemploying the millions out of work. Every encouragement should continue to be given to recovery in these lines by the national Administration and by every local facility.

"At no time in our national history has there been so great an accumulation of obsolete equipment deserving only of the junk pile," he continued.

More Cooperation Predicted

"I predict that the Administration and the Congress will find a new spirit in business, a spirit of cooperation and not of time-honored opposition to progressive legislation," W. Averell Harriman, chairman, Union Pacific railroad and temporary executive officer of the NRA, forecast. Continuing, he pointed out that busi-

ness will display "a sense of social responsibility that transcends the protection of only stockholders' rights and includes the recognition that industry must work with Government in attaining fair protection and greater security for labor.

"This change has come about, and we must admit it, partly, because, through the NRA, business has been allowed to get together without mutual suspicion and fear of breaking the anti-trust laws, and has been able to exchange views on the problems of industry and also on national social and economic problems, and partly because there is a greater understanding of the New Deal.

"Business men have learned to discriminate between the New Dealers and the New Deckers," he concluded.

Better Future for Machinery

Speaking on "Cheer for the Machinery Industry," Colonel Willard T. Chevalier, vice-president, McGraw-Hill Publishing Co., New York, said: "Let us take heart as to the prospects of these essential industries, taking counsel of the fundamental soundness of these considerations rather than the temporary bewilderment, so natural under the circumstances of the last few years.

"Today we have ample evidences of an awakened understanding. The Administration, the press, influential publicists, producers of consumers' goods and business men generally are coming to see that prosperity without productivity is an absurdity."

Mr. Chevalier also quoted statistics of the need for new machinery and of the obsolescence of current plant equipment. From these figures he predicted an encouraging future for the machinery business.

Discussion of NRA was led by Robert M. Gaylord, president, Ingersoll Milling Machine Co., Rockford, Ill., and Guy A. Wainwright, president, Diamond Chain & Mfg. Co., Indianapolis. Mr. Houston led a discussion on old age pensions and unemployment insurance.

Tax Exemption to Stimulate Plant Modernization Proposed

WASHINGTON, Nov. 27. — Plans to speed up recovery continue to multiply. They come from the Administration as well as from business sources.

The two outstanding proposals relate to proposed tax exemption in order to stimulate plant modernization. The other proposes that organized labor take a slash in building trade wages in order to develop a large construction program.

The plan to exempt corporations partially from the prevailing tax of 13.75 per cent on net returns would require that the sums exempted be expended for plant modernization.

The plan, proposed within Administration circles, has been submitted to the Treasury Department, and has met with opposition at the hands of the Bureau of Internal Revenue. Urged as a means of stimulating the durable goods industries, the proposal has been supported by some prominent economists, as well as the Federal Housing Administration, but the bureau is understood to think it is impracticable and would mean a loss rather than a gain in taxation revenue, which the bureau so earnestly desires in the face of a tremendously yawning deficit.

Proposed Cut in Building Wages

The proposal that labor take a slash in the building trades came from Secretary Ickes. He thinks it would offer an impetus to a large building program, provided that suppliers of material would agree with the Government to slash prices at the same time.

Mr. Ickes also has urged a big low cost housing program, sponsored by the Government. He and James A. Moffett, Federal housing administrator, have issued a joint statement denying conflict in policies. The FHA program for modernization and building means stimulation of these activities by private funds.

The FHA also has been active in encouraging a program of modernization of industrial plants with the result that considerable headway in this direction has been made. Both Mr. Moffett and Donald Richberg, national emergency director, have estimated that an outlay of perhaps \$1,000,000,000 could be undertaken at once on such a program. The Chamber of Commerce of the United States has also been active in such a program.

Meanwhile, Harry L. Hopkins, Federal emergency relief administrator, has given up his former stand for minimum wage rates on relief work and has ordered that hereafter the rate of pay shall be the same as that prevailing in the community where the work is done.

The Ickes plan for slashing labor rates in the building trades recalls the suggestion made by President Roosevelt in an October broadcast that less emphasis should be placed on the rate of wage and more on providing a decent annual income for workers. William Green, of the American Fed-

NRA to Decentralize Field Activities Under Rosenblatt—Other Code News

WASHINGTON, Nov. 27.—Immediate decentralization of the entire field force to expedite disposal of complaints of code violation has been authorized by the National Industrial Recovery Board. Plans for establishment of 10 regional offices with supervision of field activities were put in motion by Sol A. Rosenblatt, who was recently appointed director of field administration and enforcement.

This decentralization and consideration by the board of a report made by William H. Davis, former national compliance director, who recently returned to NRA as a special adviser on compliance and enforcement, are two principal phases in the newly launched program for energetic enforcement and improvement in general code administration.

Mr. Rosenblatt has been given wide new powers by the board, including coordination of the compliance and litigation divisions of NRA with other Governmental agencies such as the Federal Trade Commission and the Department of Justice.

Significant departures from existing procedure which will result under the new system are as follows:

1. The existing State and local compliance offices will be continued but when they cannot adjust a case they will report to the appropriate regional director for final action, instead of to Washington.
2. The regional director will either settle the case or turn it over to a regional council of three, one representing industry, another labor, and the chairman being an attorney on the staff of the litigation division.
3. In the regional director's office there will be an NRA litigation specialist who will be responsible, in conjunction with the local district attorney, for immediate action on complaints which the regional council may refer for active prosecution.
4. Efficiency is expected to result from the fact that the regional offices will be better informed as to conditions in their areas, and with only 10 instead of 54 centers reporting to Washington, the national compliance office will be able to dispatch business more effectively.

eration of Labor, said the plan was "novel." He said workers would be receptive to a system whereby they would receive a greater amount of work in compensation for lower wage scales provided a positive guarantee sealed the bargain. Mr. Green has appealed to labor to support the FHA.

It is understood that a close study will be made by the Bureau of Internal Revenue before final determination is reached as to the tax exemption plan and that especial attention will be given to claims of corporations for heavy depreciation.

5. In addition to acting on complaints as they are filed, the State and regional offices will be charged with maintaining a constant inventory on the state of labor compliance throughout the coded industries in their territory.

JOB GALVANIZING METAL COATING

The NIRB has ruled that manufacturers in the job galvanizing metal coating industry are required to follow the supplementary code authority's findings as to the recognized practice in price filing. The ruling was issued at the request of the supplementary code authority for an interpretation of Section A, Article VII of the supplementary code. This section empowers the supplementary code authority to determine whether "it has been the generally recognized practice in the industry, or in any branch or subdivision thereof, to sell certain products on the basis of net price lists, or price lists and discount sheets" and to require the filing of net price lists or of price lists with discount sheets.

The board's interpretation held that "when the supplementary code authority has determined as a matter of fact that it is the generally recognized practice in the industry to sell a product on the basis of a net price list, manufacturers are required to file net price lists. If the finding as to the generally recognized practice is a price list and discount sheet, manufacturers are required to file on the latter basis."

VITREOUS ENAMELED WARE MANUFACTURING

Certain trade practice provisions of the supplementary code of fair competition for the vitreous enameled ware manufacturing industry have been stayed to the extent of permitting members of the industry to grant terms of payment to all classes of trade not more favorable than 2 per cent for payment 10 days from end of month, and net 60 days from date of invoice.

The stay is granted, subject to cancellation, for six months to May 16, 1935. That provision of the code which allows enameled roasters shipped and billed direct to the trade after Aug. 1 of each year to be dated Nov. 1 of the same year is excepted from the stay, as is the provision allowing enameled roasters shipped and billed direct to jobbers after July 1 to be dated Oct. 1 of the same year.

SECONDARY ALUMINUM

A list of occupations deemed hazardous to persons under 18 years of age in the secondary aluminum industry has been approved by the NIRB and will become effective Dec. 9, unless

good cause to the contrary is presented. Suggestions or criticisms must be filed before Dec. 10 with Deputy Administrator W. A. Janssen.

The occupations deemed hazardous for minors are all work in the foundry proper; cleaning and grinding operations; work involving exposure to molten aluminum; employment on metal scrap; employment as drivers or assistants to drivers on motor vehicles or as helpers or delivery boys on motor vehicles; in or assisting in the operation of gas, oil or steam engines or other prime movers; in care, custody, operation or repair of elevators, cranes, derricks, or other building apparatus; in oiling, cleaning or wiping machinery or shaftings in operation; in applying belts to pulleys in motion or assisting therein.

ALLOYS INDUSTRY

Suggestions or objections concerning a proposed amendment to the code of fair competition for the alloys industry which would enlarge the code authority to eight association members and one non-association member, instead of seven association members as now prescribed in the code must be submitted before Dec. 10 to Deputy Administrator W. A. Janssen.

SAFETY RAZOR AND SAFETY RAZOR BLADE MANUFACTURING

Replying to an inquiry by the code authority for the safety razor and safety razor blade manufacturing industry, the NIRA has ruled that if employers prior to approval of the code were not requiring their regular employees to make up time taken out for legal holidays, it would now be a violation of the code for them to make a reduction in wages for such time taken out or to require their employees to make up such time. The code authority had asked if it were permissible under the code to apply the hours of legal holidays to the maximum hours per week, over the balance of the week, without the payment of overtime.

INDUSTRIAL WIRE CLOTH

The industrial wire cloth manufacturing industry has submitted for NRA approval a plan to establish a governing body for its subdivision and has proposed a list of trade practice rules which would be applicable only to its branch of the fabricated metal products manufacturing and metal finishing and metal coating industry. The wire cloth division is operating under the basic code, which permits divisions to adopt trade practice rules in addition to the regulations prescribed in the basic code.

Objections or suggestions to the proposals must be submitted to Deputy Administrator H. Ferris White, before Dec. 11.

Sponsored by the Industrial Wire Cloth Institute, which claims to represent 89 per cent of the industry's volume, the proposed plan would establish as an administrative agency, a "subdivisional committee" to consist of an undetermined number of members. An administrative representative may be appointed to this committee.

ARCHITECTURAL, ORNAMENTAL AND MISCELLANEOUS IRON, BRONZE, WIRE AND METAL SPECIALTIES MANUFACTURING

The NIRA has approved a supplementary code for the architectural, ornamental and miscellaneous iron, bronze, wire and metal specialties manufacturing industry, a division of the fabricated metal products manufacturing and metal finishing and metal coating industry. The supplementary code adopts the labor provisions of the basic code, forbids destructive price cutting, provides open price filing, and defines unfair trade practices.

The industry is defined as "the manufacturing or processing for sale—as well as contracting for manufacturing, furnishing and/or installing, repairing or servicing—of ferrous and non-ferrous metal products including aluminum, in or on any building or structure, but not including ferrous and non-ferrous metals becoming a part of the manufactured products of another industry, nor such functions of erection or installing as are subject to other codes which have been approved by the President or which may be so approved."

STEEL BARREL AND DRUM MANUFACTURING

Suggestions or objections concerning a code authority application for approval of a standard form of sales contract for members of the standard steel barrel and drum manufacturing industry must be submitted before Dec. 1, to Deputy Administrator H. Ferris White.

METAL SPINNING AND STAMPING

Approval of a supplement to the fabricated metal products manufacturing and metal finishing and metal coating code providing for a "subdivisional committee" for the metal spinning and stamping manufacturing division and establishing a group of trade practice rules to which divisional industry members will be subject in addition to the existing trade practice provisions in the master code has been announced.

Trade practice additions include a provision incorporating a ban on terms more favorable than net cash 30 days or a discount in excess of 2 per cent for cash in 10 days, a section prohibiting the pre-dating or post-dating of invoices or sales contracts, a provision designed to prevent inducing breaches of contracts between competitors and their customers, and one providing for the formulation of a cost accounting system.

MINE TOOL MANUFACTURING

A proposed appendix to the code for the fabricated metal products manufacturing and metal finishing and metal coating industry, containing additional trade practice provisions to govern members of the mine tool manufacturing subdivision, has been submitted for approval to the National Industrial Recovery Board. Suggestions or objections concerning the terms of the appendix must be filed before Dec. 12, with Deputy Administrator H. Ferris White.

The appendix was prepared in conformity with one of the provisions of the code and presented by the Mine Tool Association, claiming to represent 48 per cent of the members of the subdivision and 85 per cent by volume of the business.

One of the trade practice proposals would provide for open filing of price terms within 20 days after approval of the appendix. These terms and any revised terms would become effective immediately upon their receipt by the confidential and disinterested agent of the subdivisional committee.

CODE AUTHORITY MEMBERSHIPS

The NRA has recognized the following code authority memberships:

Electro-Plating and Metal Polishing and Metal Finishing Industry—District code committee for District No. XII. (District No. XII comprises Illinois and that portion of Indiana which lies west of a line drawn from Michigan City, Ind., through LaPorte, Ind., to Logansport, Ind.; and that portion of Indiana which lies north of a line intersecting Indiana from East to West drawn from Lima, Ohio, through Logansport and Kentland, Ind., to the eastern boundary of Illinois. The cities of Michigan City, LaPorte and Kentland, Ind., are included in District No. XII, but the city

of Logansport is excluded therefrom.)—F. J. Hanlon, Chicago City Plating Co.; R. J. Nicholson, B. Merrell & Sons Plating Co.; James McVittil, McVittil Plating & Brass Finishing Co.; H. S. Delevitt, Keystone Plating Works; C. J. Barry, Jr., Superior Plating Works; Albert Young, Triangle Auto Plating Works; H. S. Sandberg, Great Lakes Plating Co., all of Chicago.

Vise Manufacturing Industry—P. D. Wright, Reed Mfg. Co., Erie, Pa.; R. J. Simons, Rock Island Mfg. Co., Rock Island, Ill.; H. F. Seymour, Columbian Vise & Mfg. Co., Cleveland; C. S. Parker, Charles Parker Co., Meriden, Conn.; M. Kessler, Athol Machine & Foundry Co., Athol, Mass.; and W. S. Swift, American Scale Co., Kansas City, Mo.

Pipe Tool Manufacturing Industry (a division of the fabricated metal products industry)—P. D. Wright, Reed Mfg. Co., Erie, Pa.; B. I. Ashmun, The Armstrong Co., Bridgeport, Conn.; Warner Bacon, Erie Tool Works, Erie, Pa.; Horace Armstrong, The Armstrong Bros. Tool Co., Chicago; and Roger Tewksbury, The Oster Mfg. Co., Cleveland.

TRADE PRACTICE COMPLAINT COMMITTEES

The NRA has announced approval of the organization and procedure plans for handling trade practice complaints in the following industries:

Machine Tool and Equipment Distributing—George H. Cherrington, Brown & Zortman Machinery Co., Pittsburgh; Marshall Prentiss, Henry Prentiss & Co., Inc., New York; Stanley Motch, Motch & Merryweather Machinery Co., Cleveland; J. Roy Porter, Marshall & Hushart Machinery Co., Chicago; W. S. Dyson, Hallidie Machinery Co., Seattle; J. W. Wright, Colcord Wright Machinery & Supply Co., St. Louis; and C. E. Moore, Herberts-Moore Machinery Co., San Francisco.

Cast Iron Soil Pipe Industry—The industry's code authority is to constitute the committee.

Metal Window Industry—Conditional approval given procedure plan; committee to consist of three code authority members.

Steam Heating Equipment Industry—Committee to consist of not less than three members of the code authority.

Tubular Split and Outside Pronged Rivet Manufacturing Industry (A division of the fabricated metal products industry)—Conditional approval given procedure plans; committee to consist of the following supplementary code authority members: F. H. Merwin, Milford, Conn.; J. A. Morrissey, Cicero, Ill.; William P. Bartel, Waltham, Mass.; John Marshall, Boston; and William Fleming, Jr., Wapuna, Wis.

Diamond Core Drill Manufacturing Industry (a division of the machinery and allied products industry)—Conditional approval given procedure plans; committee to consist of entire divisional code authority membership.

Chain Manufacturing Industry (a division of the fabricated metal products industry)—F. A. Bond, The McKay Co., Pittsburgh; D. S. Brisbin, Columbus McKinnon Chain Corp., Tonawanda, N. Y.; L. D. Cull, Cleveland Chain & Mfg. Co., Cleveland; F. G. Hodell, the Chain Products Co., Cleveland; A. Kurz Western Chain Products Co., Chicago; E. Littman, Mixdorf-Krein Mfg. Co., St. Louis; E. W. Taylor, S. G. Taylor Chain Co., Hammond, Ind., and A. P. Van Schaick, American Chain Co., Bridgeport, Conn.

Vitreous Enameled Ware Manufacturing Industry (a division of the fabricated metal products industry)—D. S. Hunter of D. S. Hunter & Associates, Cleveland, to act as the authorized committee.

SUMMARY OF THIS WEEK'S BUSINESS

Steel Output Makes Sixth Consecutive Weekly Gain

Ingot Rate Reaches 29 Per Cent of Capacity—Much of Increase Attributable to Motor Car Industry—Scrap Unchanged

STEEL production has risen from 28½ to 29 per cent of capacity, registering its sixth consecutive weekly increase. A large part of the gain is attributable to heavier orders from automobile parts makers, although the mills are also receiving more support from the motor car makers themselves and from the farm equipment industry. Still another factor is contraseasonal expansion of tin plate production from 40 to 45 per cent of capacity, which is variously ascribed to larger exports and heavier domestic purchases for stock.

Miscellaneous demand for finished steel shows little expansion and the requirements of the railroads and the construction industry have shown no material increase. Hopes for further gains in tonnage in coming weeks are, therefore, based on the expectation that direct orders from motor car makers will mount as soon as the last kinks in their new model programs have been straightened out. Whether a heavier flow of steel to automobile manufacturers will be offset by a tightening up of orders from other sources as the year-end inventory-taking period approaches remains uncertain. The increasingly short interval at which orders are being received, however, suggest that excess consumer stocks have been liquidated and that there is little possibility of further deflating them.

THE IRON AGE scrap index, after five consecutive weekly advances, remains stationary at \$10.33 a gross ton. The failure of scrap to continue its upward trend probably means nothing more than that higher prices brought out scrap faster than steel company consumption increased. The recent expansion in finished steel orders has lifted mill operating rates more rapidly than open-hearth melt. In the important Pittsburgh district, for example, ingot output has remained unchanged at 18 per cent for the past six weeks. On the other hand, sheet mill operations of the country have reached 40 per cent of capacity, the highest rate since June.

The reaffirmation of pig iron and steel prices for first quarter will undoubtedly release considerable delayed buying, especially contract tonnage for the first three months of next year, but it will probably have

little influence on bookings for shipment this year. Nevertheless, the filing of prices has had a stabilizing effect on the market. At the same time current evidences of conciliation and collaboration between industry and Washington have had a reassuring effect on business generally. Apprehension still exists regarding the radical complexion of the incoming Congress and the militant attitude of organized labor, although there is growing confidence in the power of the Administration to overcome obstacles to the policy it is now pursuing. It is felt that the projected truce in the steel industry, rejected by union leaders last week, may yet be effected through the influence of the President.

STRUCTURAL steel lettings of 29,300 tons, the largest since the first week in June, were swelled by awards of 16,200 tons for a Federal building in New York and 3600 tons for a hospital in Jersey City. Plate lettings total 1550 tons, and inquiries include 4000 tons for an Oregon pipe line. Sanitary ware makers have become more active on home modernization orders and are melting more pig iron. It is doubtful whether the Federal Housing Administration's plans to stimulate residential construction or the Public Works Administration's slum clearance program can get under way on a large scale before spring.

RAIL mills have been authorized to book business at unchanged prices until March 1 for shipment before July 1, but little tonnage is in sight. The Ensley rail mill will reopen Dec. 10 for a week's run. The Capital Transit Co., District of Columbia, has ordered 20 street cars to be built of high-tensile steel.

Steel output has risen two points to 39 per cent at Cleveland, one-half point to 33½ per cent at Chicago, four points to 21 per cent in the South, and four points to 52 per cent at Detroit. Production rates elsewhere are substantially unchanged.

THE IRON AGE composite prices for pig iron and finished steel are unchanged at \$17.90 a ton and 2.124c. a lb. respectively. Toledo automobile parts makers are protesting against their disadvantage in delivered prices as compared with Detroit competitors.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Nov. 27, 1934	Nov. 20, 1934	Oct. 30, 1934	Nov. 28, 1933
<i>Per Gross Ton:</i>				
No. 2 fdy., Philadelphia....	\$20.26	\$20.26	\$20.26	\$18.26
No. 2, Valley furnace.....	18.50	18.50	18.50	17.50
No. 2 Southern, Cin'ti.....	19.13	19.13	19.13	18.13
No. 2, Birmingham.....	14.50	14.50	14.50	13.50
No. 2 foundry, Chicago*.....	18.50	18.50	18.50	17.50
Basic, del'd eastern Pa.....	19.76	19.76	19.76	17.76
Basic, Valley furnace.....	18.00	18.00	18.00	17.00
Valley Bessemer, del'd P'gh..	20.76	20.76	20.76	19.76
Malleable, Chicago*.....	18.50	18.50	18.50	17.50
Malleable, Valley.....	18.50	18.50	18.50	17.50
L. S. charcoal, Chicago.....	24.04	24.04	24.04	23.54
Ferromanganese, seab'd car- lots.....	85.00	85.00	85.00	82.00

†This quotation is for delivery in South; in the North prices are 38c. a ton under delivered quotations from nearest Northern furnace.

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Finished Steel

	Nov. 27, 1934	Nov. 20, 1934	Oct. 30, 1934	Nov. 28, 1933
<i>Per Lb.:</i>				
Hot-rolled annealed sheets, No. 24, Pittsburgh.....	2.40	2.40	2.40	2.25
Hot-rolled annealed sheets, No. 24, Gary.....	2.50	2.50	2.50	2.35
Sheets, galv., No. 24, P'gh..	3.10	3.10	3.10	2.85
Sheets, galv., No. 24, Gary...	3.20	3.20	3.20	2.95
Hot-rolled sheets, No. 10, P'gh	1.85	1.85	1.85	1.75
Hot-rolled sheets, No. 10, Gary	1.95	1.95	1.95	1.85
Wire nails, Pittsburgh.....	2.60	2.60	2.60	2.10
Wire nails, Chicago dist. mill	2.65	2.65	2.65	2.15
Plain wire, Pittsburgh.....	2.30	2.30	2.30	2.10
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.15
Barbed wire, galv., P'gh.....	3.00	3.00	3.00	2.60
Barbed wire, galv., Chicago dist. mill.....	3.05	3.05	3.05	2.65
Tin plate, 100 lb. box, P'gh..	\$5.25	\$5.25	\$5.25	\$4.65

Scrap

<i>Per Gross Ton:</i>				
Heavy melting steel, P'gh....	\$11.25	\$11.25	\$10.50	\$11.50
Heavy melting steel, Phila....	10.25	10.25	9.63	9.75
Heavy melting steel, Ch'go...	9.50	9.50	8.75	8.50
Carwheels, Chicago.....	10.00	10.00	9.50	9.00
Carwheels, Philadelphia.....	10.75	10.75	10.50	10.75
No. 1 cast, Pittsburgh.....	11.50	11.50	11.25	11.25
No. 1 cast, Philadelphia.....	11.00	11.00	10.75	11.25
No. 1 cast, Ch'go (net ton)...	8.50	8.50	8.00	8.50
No. 1 RR. wrot., Phila.....	11.25	11.25	11.25	11.00
No. 1 RR. wrot., Ch'go (net)...	8.75	8.75	7.00	7.25

Coke, Connellsville

<i>Per Net Ton at Oven:</i>				
Furnace coke, prompt.....	\$3.85	\$3.85	\$3.85	\$3.75
Foundry coke, prompt.....	4.60	4.60	4.60	4.25

Metals

<i>Per Lb. to Large Buyers:</i>				
Electrolytic copper, refinery†.	8.75	8.75	8.75	8.00
Lake copper, New York.....	9.12 ½	9.12 ½	9.12 ½	8.25
Tin (Straits), New York.....	51.30	51.20	51.35	53.25
Zinc, East St. Louis.....	3.67 ½	3.72 ½	3.85	4.50
Zinc, New York.....	4.02 ½	4.07 ½	4.20	4.85
Lead, St. Louis.....	3.35	3.35	3.55	4.15
Lead, New York.....	3.50	3.50	3.70	4.30
Antimony (Asiatic), N. Y....	13.00	11.87 ½	9.75	7.25

Rails, Billets, etc.

<i>Per Gross Ton:</i>				
Rails, heavy, at mill.....	\$36.37 ½	\$36.37 ½	\$36.37 ½	\$36.37 ½
Light rails, Pittsburgh.....	35.00	35.00	35.00	32.00
Rerolling billets, Pittsburgh..	27.00	27.00	27.00	26.00
Sheet bars, Pittsburgh.....	28.00	28.00	28.00	26.00
Slabs, Pittsburgh.....	27.00	27.00	27.00	26.00
Forging billets, Pittsburgh...	32.00	32.00	32.00	31.00
Wire rods, Pittsburgh.....	38.00	38.00	38.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb...	1.70	1.70	1.70	1.60

Finished Steel

<i>Per Lb.:</i>				
Bars, Pittsburgh.....	1.80	1.80	1.80	1.75
Bars, Chicago.....	1.85	1.85	1.85	1.80
Bars, Cleveland.....	1.85	1.85	1.85	1.80
Bars, New York.....	2.13	2.13	2.13	2.08
Plates, Pittsburgh.....	1.80	1.80	1.80	1.70
Plates, Chicago.....	1.85	1.85	1.85	1.75
Plates, New York.....	2.08	2.08	2.08	1.98
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.70
Structural shapes, Chicago...	1.85	1.85	1.85	1.75
Structural shapes, New York.	2.05 ¼	2.05 ¼	2.05 ¼	1.95 ¼
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	1.95
Hot-rolled strips, Pittsburgh.	1.85	1.85	1.85	1.75
Cold-rolled strips, Pittsburgh.	2.60	2.60	2.60	2.40

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables. †Blue Eagle copper.

▲▲▲ The Iron Age Composite Prices ▲▲▲

Finished Steel

Nov. 27, 1934	2.124c. a Lb.
One week ago	2.124c.
One month ago	2.124c.
One year ago	1.995c.

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.

Pig Iron

\$17.90 a Gross Ton
17.90
16.61

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Steel Scrap

\$10.33 a Gross Ton
10.33
9.63
9.92

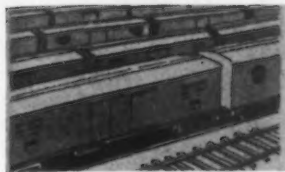
Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	HIGH	LOW
1934	2.199c., April 24;	2.008c., Jan. 2
1933	2.015c., Oct. 3;	1.867c., April 18
1932	1.977c., Oct. 4;	1.926c., Feb. 2
1931	2.037c., Jan. 13;	1.945c., Dec. 29
1930	2.273c., Jan. 7;	2.018c., Dec. 9
1929	2.317c., April 2;	2.273c., Oct. 29
1928	2.286c., Dec. 11;	2.217c., July 17
1927	2.402c., Jan. 4;	2.212c., Nov. 1

	HIGH	LOW
1934	\$17.90, May 1;	\$16.90, Jan. 27
1933	16.90, Dec. 5;	13.56, Jan. 3
1932	14.81, Jan. 5;	13.56, Dec. 6
1931	15.90, Jan. 6;	14.79, Dec. 15
1930	18.21, Jan. 7;	15.90, Dec. 16
1929	18.71, May 14;	18.21, Dec. 17
1928	18.59, Nov. 27;	17.04, July 24
1927	19.71, Jan. 4;	17.54, Nov. 1

	HIGH	LOW
1934	\$13.00, Mar. 13;	\$9.50, Sept. 25
1933	12.25, Aug. 8;	6.75, Jan. 3
1932	8.50, Jan. 12;	6.42, July 5
1931	11.33, Jan. 6;	8.50, Dec. 29
1930	15.00, Feb. 18;	11.25, Dec. 9
1929	17.58, Jan. 29;	14.08, Dec. 3
1928	16.50, Dec. 31;	13.08, July 2
1927	15.25, Jan. 11;	13.08, Nov. 22

Steel Orders Rise in Pittsburgh District



**Finishing Mill Operations Improve
Though Ingot Output Is Unchanged
—Scrap Market Is Less Buoyant**

PITTSBURGH, Nov. 27.—Steel orders are beginning to flow with more freedom. Automotive demand at present is accounting for measurably heavier orders for sheets, strips and cold-finished bars. Some Pittsburgh district mills are also benefiting by good seasonal demand from agricultural implement manufacturers. Miscellaneous tonnage has leveled off. Substantial export orders from the Far East and heavy contract releases have sustained tin plate operations at about 45 per cent of capacity. Activity in the plate market centers in barge construction, which may reach important proportions if current inquiries materialize.

A joint rail project in the Muskingum Valley Conservancy district in Ohio, requiring about 55 miles of steel rails, may soon take shape. Constructional steel is in poor demand.

With aggregate steel orders expanding, finishing mill schedules are headed higher. Sheet mill output this week will be at the highest point since June. Accelerated mill schedules have not thus far, however, necessitated increased raw steel output in the Pittsburgh district, which this week is unchanged at 18 per cent for the sixth consecutive week. Activity in the Wheeling district is steady and unchanged at 55 per cent, while output in the Valleys and nearby northern Ohio mills is likewise holding at 32 per cent.

Pig Iron

Present base prices at Neville Island and Sharpsville have been reaffirmed for first quarter delivery. Although producers and consumers of pig iron in this district are more cheerful, the improved sentiment has not affected bookings materially. Aggregate tonnage in November has gained slightly over that for October. Until large-lot buying by basic and Bessemer consumers appears, no noticeable change in this market is expected. With all consumers protected against higher prices through first quarter, it seems likely that forward buying will probably continue on a very restricted basis.

Semi-Finished Steel

With current quotations reaffirmed for first quarter shipment, detached

mills are now protected against higher prices for the next four months. Hence it would be unusual to expect any sharp fluctuations in demand. Forging billets are slightly more active, while skelp is still in fair demand from some non-integrated tube mills. Continued improvement in sheet bar deliveries to detached sheet mills is offset to some extent by reduced shipments for tin plate conversion.

Bolts, Nuts and Rivets

Orders received in this district are still very light. Some small producers are quoting an additional 5 per cent off the published discounts, but most large makers are refusing to meet such competition. The effect of the slight unsettlement in prices on the consuming trade has thus far been nil. First quarter discounts are expected to be announced on Dec. 1.

Bars

Automotive demand is still sporadic, while miscellaneous tonnage is maintaining an even keel. Aggregate tonnage in the past week showed very little improvement over the preceding period. Alloy bar shipments are holding their own. All important producers have reaffirmed the present Pittsburgh base of 1.80c. a lb. for first quarter shipment. Some makers have already expressed willingness to accept contracts for that period, but consumer response has been negligible.

Warehouse Business

November tonnage, on the whole, has improved slightly over that for October. The general reaffirmation of mill prices for first quarter has steadied price conditions in the warehouse trade, and present jobbing schedules will probably be extended to the next quarter.

Reinforcing Steel Bars

The present price of 2.05c., Pittsburgh, for billet steel reinforcing in straight lengths as quoted by distributors has been reestablished for first quarter shipment. Releases are coming in with unusual freedom at this season, and reinforcing bar mills are maintaining fairly regular operating schedules. Specifications for highway

work in Pennsylvania, Ohio and West Virginia are appearing, but actual construction, except in special cases, will not begin until spring. Small private jobs are increasing encouragingly.

Cold Finished Steel Bars

With one or two exceptions, producers have reaffirmed the Pittsburgh base of 2.10c. for first quarter. Alloy cold-finished bars are expected to be reaffirmed at 2.95c., base per lb. A more pronounced improvement in orders was noticed last week. Demand from automotive centers accounted for the increase. Releases from agricultural implement makers are well sustained, with manufacturers of business machines and textile machinery participating in the present market on a more moderate scale.

Plates and Shapes

About 1500 tons of plates and shapes is expected to be purchased in the Pittsburgh district for the construction of seven standard coal barges by the Marietta Mfg. Co., Point Pleasant, W. Va., which has been awarded the contract by West Kentucky Coal Co., Paducah, Ky. The order may be increased later by three units. The Solvay Process Co., Syracuse, N. Y., is reported to have awarded a contract to the St. Louis Shipbuilding & Steel Co. for a mooring barge, requiring about 750 tons of plates and shapes. Interest of the Commonwealth Edison Co. affiliate at Chicago in 24 standard coal barges and 16 covered cargo barges is still alive, and promises a substantial tonnage of plates when and if orders are placed. Plate requirements in other consuming quarters are generally restricted. The structural steel market reflects no encouraging trend, with inquiries individually small and few. Awards in the past week also lacked feature. Fabricating schedules in this district, however, are well sustained by generous backlogs.

Rails and Track Accessories

The present rail price of \$36.37½ a ton has been reaffirmed to apply to orders entered before March 1 for shipment by June 30. Track spikes and tie plates also have been reaffirmed at present bases.

Tubular Products

Practically all important pipe producers have filed present discounts for extension to first quarter. Output at some small independent mills continues to expand, while in the case of one or two larger producers schedules have been scaled down. Demand for oil country goods from certain districts is slightly improved, but a general seasonal decline is believed imminent. Small-diameter tubing is relatively quiet. A bare improvement is noticeable in demand for mechanical tubing for automotive consumption.

Railroad requirements are routine and for restricted quantities.

Wire Products

With current prices to be re-established for first quarter shipment, improved releases from the jobbing trade are in prospect, since specifications from that quarter are believed to have been held up in many cases because lower prices had been expected. Aggregate shipments in November will reflect moderate improvement over the movement last month. Automotive specifications have not shown any significant increase, and wire mills are still counting on this business to benefit December schedules. At present, output shows little change from the recent general average of 20 to 25 per cent.

Sheets

Sheet demand in the past week staged a good recovery. Automotive specifications were the prime factor in the increase, while miscellaneous tonnage held its own. Sheet operations this week are expected to average 40 per cent of capacity, the highest point since last June. With orders from motor car and parts makers expected to expand measurably next month, operations in all likelihood will push higher. All doubts as to the early course of prices have been swept aside by the reaffirmation for first quarter delivery of present quotations for all grades of sheets.

Tin Plate

The current price of \$5.25 base per box, Pittsburgh, for standard coke tin plate has been reaffirmed for the contract period in 1935. Operations are again displaying contraseasonal tendencies, with the average output this week expected to rise five points to 45 per cent of capacity. The latest surge in activity is attributable to substantial export orders for the Far East and urgent heavy specifications from can manufacturers. Some small producers are falling under the usual influence of the season and are operating far below the general average. General specifications are considered likely to increase, now that no change in price will be made.

Strip Steel

Further gains in orders are reported by producers in this district. The improvement is noteworthy in that it has been scored without substantial aid from the automotive industry. Exceptions are heavier releases from some parts makers. More frequent requests for shipments are expected to come from automotive centers at the turn of the month. Miscellaneous tonnage is playing a strong part in the present market. Makers of steel shelving and steel furniture are frequently calling for strips. Hot rolling at some mills has been on a sustained schedule for some weeks, and the prospects for im-

proved engagement are considered good for December. The present rate for the strip industry is around 30 to 35 per cent of capacity. All producers have filed first quarter prices on the basis of present schedules.

Coke and Coal

Neither the bituminous coal market nor the foundry and furnace coke market can be termed active. Final shipments of slack for Lake movement have been dispatched, and this outlet will now be closed to mines in this district until next spring. Continued screening for domestic sizes will, therefore, probably create a growing surplus of slack, which in the face of low industrial activity here, will probably be difficult to move. No changes in coke or coal prices are reported.

Scrap

While the scrap market has lost none of its recent strength, consumer interest has waned. Small mills are still nibbling for stray carloads, but despite reports important mills in this district are not openly or quietly covering on major tonnages at the moment. The initial rise in prices in the recent movement has been scored wholly without the aid of increasing steel operations in this district and further enhancement in scrap values may hinge largely on greater open-hearth activity. A mill in a nearby district is covering daily on its requirements of scrap and dealer bidding for that destination, which entails unusual competitive circumstances, has in some instances gone as high as \$12 for No. 1 heavy melting steel. That figure, however, has little or no bearing on the Pittsburgh market for that grade. Machine shop turnings and short shoveling turnings are stronger, while practically all other grades remain quiet and quotably unchanged.

Steel Business Lags At St. Louis

ST. LOUIS, Nov. 27.—While the business of jobbing foundries is said to be improving and the melt in the stove foundries in the district continues at a good rate, with the prospect that the recent cold weather will tend to stimulate movement of stocks from retailers and cause re-orders, operations of the steel mills are at a low ebb. At present one company is operating an average of three open-hearth furnaces. One steel mill has closed down because of repairs and expects to be down for a week longer, while another which has considerable business booked is awaiting specifications before proceeding further.

A general slowing down of business in finished iron and steel is reported.

Fabricators of structural steel in the St. Louis district are now operating at an average of about 20 per cent of capacity, with individual rates ranging from 10 to 50 per cent for the seven plants. The Laclede Power & Light Co. has taken bids on a power house, which will require 500 tons of structural steel. Oklahoma will take bids on Dec. 4 for two highway bridges calling for 1600 tons of structural steel. The St. Louis Shipbuilding & Steel Co. has been awarded a barge for Semet-Solvay Co. at Baton Rouge, La., requiring 800 tons of plates. The Missouri State Highway Commission's 1935 program will total between \$11,000,000 and \$12,000,000, a reduction of one-third from 1934.

The scrap market continues firm, with prices higher on some items, although buying by the district steel mills continues light. Offerings of scrap are said to be light, and dealers are not inclined to sell at present levels. Brokers with short sales are said to be finding it difficult to cover. Miscellaneous standard-section rails and steel car axles are 25c. a ton higher, and railroad springs, bundled sheets, No. 2 railroad wrought and iron car axles are 50c. a ton up.

Buffalo Scrap Market Strengthens

BUFFALO, Nov. 27.—The scrap market is the strongest it has been for weeks. The principal consumer in this district has increased its offering price for No. 1 heavy melting steel to \$10, but is believed to be getting only scattered small lots. Dealers expect that the price of scrap will go higher in the near future, particularly in view of the strength of the Pittsburgh and Youngstown markets. Dealers are paying \$8.75 to cover on the last orders of No. 2 steel, with the probability that they are making a minimum of profit on the transaction. More activity is apparent on the part of district foundries, which are buying No. 1 machinery cast and paying \$11 to \$11.50, Buffalo. Pittsburgh is offering \$11.50 for new hydraulic compressed sheets; an inquiry is out for several hundred tons of short rails. Little scrap is coming in to Buffalo from the usual sources of supply in central New York. Most of this material is going to seaboard for export; it is estimated that 1,250,000 tons of scrap has been shipped out of this country since Jan. 1.

Steel mill operations are unchanged from last week. A changeover in blast furnaces having been completed at the Bethlehem Lackawanna plant, one stack has been left in operation.

The United States Corps of Engineers, which advertised for bids on a derrick boat to require 250 tons of structural steel, received the low bid from the Treadwell Construction Co., Midland, Pa.

Chicago Rate Up One-Half Point to 33½ Per Cent



Automobile and Implement Makers Are Leading Sources of Tonnage — Chicago Shop to Build 1200 Mexican Cars

CHICAGO, Nov. 27.—Ingot output in the Chicago district has risen another half point to 33½ per cent of capacity. This gain, though smaller than the average in recent weeks, holds the industry on the upward trend line which in all probability will be maintained if current specifications give the key to nearby operations. Releases reaching mills from automobile plants and farm implement manufacturers assume leadership in the gains recorded. There is as yet no material upswing in miscellaneous demand, nor has there been a decline. Orders remain small and are coming in at shorter intervals, indicating that stocks in the hands of consumers are far less of a market factor than they were a month or six weeks ago.

One of the most encouraging signs is the interest shown by consumers in commitments that will cover first quarter deliveries. Sellers are now of the opinion that when contracting opens on Dec. 1 their books will start to grow and will easily top the forward buying movement that took place at the approach of the fourth quarter.

A Chicago plant will build 1200 cars for the National Railways of Mexico and not a week goes by without announcement of new railroad car air-conditioning programs. In the meantime, however, rail demand remains dormant and mills keenly feel the lack of support which rail tonnages usually supply at this time of year.

Pig Iron

November shipments are fully 10 per cent ahead of October and releases for the early part of December point to a further rise. Jobbing foundries still find business spotty and their output is not above 30 per cent of capacity.

Coke

November prices are being carried forward for deliveries in December. Consumers are taking this commodity more freely.

Warehouse Business

Orders are showing the customary seasonal decline from October volume. However, the change this year is less than normal. At the end of November the drop is not over 10 per cent.

Warehousemen agree that the outlook for the opening months of 1935 is favorable.

Plates

Prospects are improving and some added business is reaching this market. The National Railways of Mexico have ordered 800 box cars, 200 narrow-gauge cars and 200 gondola cars from the Pullman Car & Mfg. Corp. Once again Western railroads are starting large-scale programs for the wrecking of obsolete equipment. Mills take this to mean that replacement orders are in the making, though perhaps not imminent. A pipe line at Luce, Ore., is out for figures. This will add 4000 tons of plates to mill books. Two dams across the Mississippi River are scheduled to be let in the next few weeks. Each one will account for some plate tonnage.

Bars

Specifications from automobile and farm implement plants continue to broaden and sellers are convinced that both industries will take increasing tonnages in the early part of December. Road machinery manufacturers have snow plow orders out of the way but, planning for early spring demand, are holding production schedules on an even keel. Miscellaneous demand for bar mill products has shown little change but the fact that it does not lose ground is a satisfying sign to the steel trade.

Rails

Railroads are moving cautiously and so far as can be ascertained now no very active buying programs are at hand. Several budgets are being prepared and they include some rail tonnage. However, mills look to Government aid for the railroads for real stimulation of this market. Orders for light rails remain spotty and in small volume.

Wire Products

Shipments are moving upward, with the result that November will top October by at least 15 per cent. Ordinarily October is a better month than November, but this year most consumers find business slowly improving as the year approaches its end and, with stocks low, are being forced into the market. Producers are optimistic, particularly because of the low level

of their own stocks, and they contemplate satisfactory production schedules during the winter months. Inquiries now being made concerning first quarter commitments point to a contracting period that will be the best since the second quarter rush.

Structural Material

Fresh inquiries and awards are not numerous, but the average tonnage shows considerable improvement. Among the most active jobs at this time are one of the dams across the Mississippi River and 400 tons for several bridges in Wisconsin.

Reinforcing Bars

The outlook in this market is further improved, with the possibility that the Outer Drive project in Chicago may go ahead with State funds. Probably over 5000 tons of bars will be required. Also, Illinois announces that sizable bids on road and bridge work will be taken before Jan. 1. A Chicago syndicate will build a new motion picture theater, and a large slaughter house will be added by Armour & Co. Low bidders are announced on a number of jobs, bars for which should soon be on shop books. Small projects are no less numerous than a week ago. Current prices were refiled on Nov. 20, but reinforcing bar prices continue to be subjected to stress whenever large tonnages are being bid.

Cast Iron Pipe

Carload business for use by municipalities remains active, but large tonnages are scarce. Fond du Lac, Wis., has thrown out bids and will readvertise. Chicago has announced the low bidder on 100 tons, and two lots of substantial size have been ordered in Wisconsin. Sellers do not believe that winter buying prices will be offered. They are of the opinion that such a move would not stimulate the market to any marked degree.

Scrap

Prices remain strong, but there are several major changes in this market that may temporarily check further price advances if not actually result in a decline. Dealers have been buying rather heavily and old orders have about vanished. There may be some trouble in keeping this tonnage moving. Also, the railroads are again swinging into active campaigns of wrecking old rolling stock and it is only a matter of time before railroad scrap offerings will grow. A more liberal buying attitude on the part of mills is needed to hold equilibrium in this market. Contrary to the above facts are the opinions of some dealers that higher prices are soon to be realized. Offerings include 1000 tons by the Illinois Central and 800 tons by the St. Louis-Southwestern.

Philadelphia District Operations at 24 Per Cent



**Rolling Mill Schedules Holding Their Own
With Buying Still Confined to Small Lots
for Immediate Needs—Prices Reaffirmed**

PHILADELPHIA, Nov. 27.—Steel buyers in this district have apparently greeted the reaffirmation of iron and steel prices for first quarter with continued apathy. While sellers are not permitted to take first quarter contracts until Dec. 1, they do not expect consumers to show much interest at that time in their forward requirements. The latter are taking steel only as they need it and their needs will certainly not expand before Jan. 1. Under the circumstances, the steel industry next month will not likely show much change from November, but optimism for the first quarter is quite undimmed.

Ingot production this week is just about holding its own at 24 per cent of capacity. One large plant, which manufactures lighter products principally is engaged at 30 per cent or better, but the smaller companies continue to make steel at 20 to 25 per cent of capacity and the leading interest is scarcely averaging 25 per cent. Current shipments hardly justify this rate, but mills are not anxious to stock steel and are eating into their backlogs when necessary. Backlogs consist largely of structural steel jobs and shipbuilding contracts for the Navy.

Opposition to the charging of quantity extras on plates and shapes which becomes effective Dec. 1 is particularly strong in this territory. Not only are structural fabricators, railroads and small jobbers violently opposed to the idea, but even mills, in some instances, are no longer supporting the move. It is still believed in some quarters that a further postponement of the effective date of the ruling may be necessary.

One of the principal arguments against the quantity extra charges is the fact that they would make the sale of foreign steel much easier on the Atlantic Seaboard. One large importer is already considering the enlargement of its distribution facilities in several seaboard cities.

Pig Iron

Current prices have been reaffirmed for first quarter, but the trade is showing little interest. Today's business is still confined to carload lots and the stocks of some consumers are

still ample to last well into the new year. Foundry consumption is probably holding its own except in the case of pipe manufacturers. They have curtailed output in the last month and are now engaged at barely 25 per cent of capacity. Eastern Pennsylvania producers are quoting basic iron at \$19, furnace, foundry at \$19.50, malleable at \$20 and Bessemer at \$20.50 a ton.

Bars, Plates, and Shapes

Structural steel and reinforcing bar jobs are still very scarce in this district, although fabricators are figuring on a fair tonnage for other destinations. Inquiry is also light as Government-financed projects are no longer appearing in significant volume. Road work is slowing up in anticipation of colder weather. Steel makers are watching the railroads closely for some sign of action but the continued low volume of carloadings seems to preclude anything but mini-

Active Machinery Demand in Canada

TORONTO, ONT., Nov. 27.—The automotive industry is arranging to get under way for large production early in the new year and on this account several companies are installing new machinery and equipment. It is reported that Canadian Acme Screw & Gear Co., a subsidiary of Russell Motor Car Co., Toronto, has imported from the United States \$100,000 worth of machinery, preliminary to large-scale production of parts for Chrysler Corp. in Canada. Several other companies are said to be considering plans for improving plant equipment and it is stated that the demand for machine tools is increasing. The mining industry also is furnishing a good demand for tools and several companies are said to be in the market, or nearing the stage where mills are required. Locomotive and rolling stock plants are still awaiting the placing of orders from the Canadian National and Canadian Pacific Railroads, while steel mills are maintaining steady production and report fair backlogs and a steady flow of small tonnage business.

mum expenditures. The Pennsylvania was reported to have arranged for a large equipment loan, but it is now believed that the money obtained will be used to pay for electric locomotives placed recently. The Navy Department has considerable steel to buy, but is slow in making awards after bids are taken.

Sheets

Automobile stamping plants are increasing their production schedules, but have not yet bought steel in significant quantities. Other consumers are generally dormant. Warehouses appear to have ample stocks and radio makers have passed the peak of their production seasons. Toy manufacturers are busy and fabricators of air-conditioning equipment will be active during the greater part of the winter.

Imports

The following iron and steel imports were received here last week: 100 tons of iron ore from Spain, 55 tons of ferromanganese from Norway, 25 tons of manganese ore from Egypt, and 22 tons of structural shapes from France.

Scrap

While the market continues very strong, no sales into consumption have been made which would establish the market on a higher quotable level. Brokers would ask at least \$11 for any sizable tonnage of No. 1 heavy melting steel, but this figure has not been tested. The No. 2 grade is up 50c. a ton on the strength of a recent purchase and stove plate and new hydraulic bundles are stronger.

Demand for merchant pig iron is showing improvement and sales are running well above those for the corresponding period of last year. Iron sales are holding around 600 tons per week. Production for October exceeded 46,000 tons, the highest record for the year. Output, however, was mostly basic iron for further use of producing companies. Pig iron imports are restricted to small tonnage lots from American points and are confined to special grades. British imports have been suspended for the year. Prices are firm and unchanged.

While there is a steady flow of small tonnage business in the iron and steel scrap markets, sales mostly are confined to special grades and small tonnage lots. Steel mills are not in the market, except for special grades and shipments of heavy melting steel and turnings to the Hamilton district are limited. Montreal dealers state, however, that old lot shipments of steel scrap are being made to Sydney, N. S., although the Dominion Steel & Coal Co. is obtaining most of its supplies from the United States. Dealers are holding price lists unchanged.

Steel Demand Gains In Cleveland District



**Most of the Increase Is Attributable to
Automobile Parts Makers—Ingot Output
Up Two Points to 39 Per Cent**

CLEVELAND, Nov. 27.—Demand for steel bars, sheets and strip steel gained during the week as new business came from stamping plants, forge and other shops doing automobile work. Many of these plants in this territory now have a fair volume of business and have secured releases from their automotive customers permitting them to get under production. Orders for rather small tonnages continue to flow in from the Michigan automobile plants.

Tonnage entered by local steel offices during November will show a moderate gain over October, although there has been little, if any, increase in orders for shapes and plates. Ingot output in the Cleveland-Lorain territory gained two points this week to 39 per cent of capacity. Two open-hearth furnaces were put on in Lorain and one was taken off in Cleveland.

Sentiment in the steel industry is better, largely because of the increase in business from automotive sources and the expectation that the demand from this field will gain further in December. Little tonnage is coming from the railroads, and activity in the building field is limited.

Relocation of tracks in connection with the Muskingum Valley Conservancy project will require 10,000 tons of rails which will be purchased by the railroads. Twenty-seven miles are to be relocated by the Wheeling & Lake Erie, 18 miles by the Baltimore & Ohio, and 10 miles by the Pennsylvania Railroad. This project will also require 25 steel bridges which Government engineers will award early next year. This project will involve an expenditure of \$34,590,000. Bids were taken recently for three dams in connection with the project.

Pig Iron

Sales continue to gain and November shipments will show an increase of about 30 per cent over October. The increased demand is coming largely from automobile foundries. One order for 1000 tons of foundry iron came from that source during the week, and there were several sales of lots ranging from 250 to 500 tons. Some fresh business came from malleable foundries making automobile castings. The Federal housing proj-

ect is being reflected in improved activity by the sanitary ware industry, from which some new pig iron business is coming. With books to be opened Dec. 1 for the first quarter at reaffirmed prices little contracting is looked for, as foundries are expected to adhere to their present policy of buying iron only as needed.

Sheets

Demand is on the up trend. Considerable business in automobile parts has been placed with stamping plants in this territory and orders are now coming from this source. Business continues to come directly from the motor car manufacturers and while the orders from them are not large, in the aggregate they make a fair tonnage. Demand from stove makers continued fair.

Strip Steel

Some of the leading automobile accessory manufacturers placed substantial tonnages in both hot and cold-rolled strip during the week for early shipment. These plants have not been in the market since making purchases several weeks ago. Miscellaneous demand is light.

Iron Ore

The shipping season closed this week with a total movement by water of 22,249,600 tons, a gain of 625,703 tons over last year. Shipments by ports for the season are listed in another column.

Bolts and Nuts

Good-sized orders were placed during the past few days by some of the motor car manufacturers. Demand from the agricultural implement makers has become quite good and the volume of miscellaneous business is improving. Makers complain that the present 70, 10, 10 and 10 discount is below manufacturing cost but they are committed to this price for the remainder of the year.

Bars, Plates, and Shapes

Bar orders have gained. While most of the increase is coming from automotive sources, there is an improved demand from agricultural implement manufacturers and miscellaneous users. Reinforcing bars are dull, although three local public jobs are

pending, requiring 600 tons. Demand for small lots of shapes for private building work has improved. The only sizable new inquiry is for 400 tons for a Toledo factory building. Placing of 3060 tons for the Lorain road bridge, Cleveland, is being deferred by the general contractors. New quantity extras on plates and shapes and floor plates previously issued but suspended will be placed in effect Dec. 1 for shipment after Dec. 31, but the extras will not apply to steel bought in December for identified structures for first quarter delivery.

Scrap

Brokers have marked up their prices 25c. a ton on steel-making grades for shipment against the heavy tonnage recently purchased by a Youngstown district mill and are now paying \$10.75 for No. 1 heavy melting steel, \$10 for No. 2 and \$10.25 for compressed sheet steel. The market is very firm and these prices are not bringing out an abundance of scrap. Locally the market is inactive and quotations are unchanged.

Scrap Advanced at Cincinnati

CINCINNATI, Nov. 27.—The district scrap market has become bullish. The entire list of dealers' bids has been advanced from 25c. to \$1 a ton. The trade, having been without business for four months, is speculating on the mill needs for first quarter. The only recent business of interest was the movement of an accumulation of 1000 tons of No. 2 steel by barge to upper Ohio River users. Prices on a small sale of clippings to one mill in this district at improved quotations reflect the improved market feeling.

The pig iron market is apathetic. Books for fourth quarter are closed and the opening date for first quarter is still a week away. Prices for new business were affirmed, the past week, at the fourth quarter level. Northern foundry iron is still quoted at \$19.51, delivered in Cincinnati, while Southern remains at \$19.13. The Columbus, Ohio, furnace of American Rolling Mill Co. has been blown out. The melt is unchanged, stove foundries reporting exceptionally good production.

Movement of foundry coke is without noticeable feature, improvement being largely seasonal. Domestic grades have been stimulated by colder weather.

Demand for sheets is widely distributed. Automotive tonnage shows a tendency toward improvement, with heavier releases imminent. Reaffirmation of present prices for first quarter will tend to avert an early rush to cover and will probably sustain the present steady demand. Production is better than 40 per cent of capacity on a par with demand.

Heavy Rolled Products Come To the Fore at New York



Federal Building Award Involves 16,200 Tons — Triborough Bridge May Take 50,000 Tons — Small Fabricators Use Foreign Steel

NEW YORK, Nov. 27. — Steel bookings in this territory continue to show slight improvement, but with the year-end inventory taking period approaching a temporary reversal of the present trend may soon become manifest. However, such a reaction would probably not be pronounced since present buying is mainly for spot needs, stock accumulations with certain exceptions having been liquidated.

The market for heavy rolled products has been featured by the award of the superstructure for the local Federal building, 16,200 tons, to McClintic-Marshall Corp. The contract for the foundation of the Federal building also involves a considerable tonnage of steel, which will be bought within the next month. The steel requirements for the repair of 1350 Lehigh Valley cars are about to be placed. The Capital Transit Co., District of Columbia, has ordered 20 street cars which will be built of Cor-Ten high-tensile steel.

Bids are expected to be asked before the close of the year on the main span and approaches of the Triborough bridge, New York, requiring upward of 50,000 tons of steel. The towers are nearly completed and the cable was placed some time ago. Considerable heavy construction work in this area is being held back by confusion as to wage rates and labor controversies.

Export demand is improving, with both Mexico and the Orient taking more steel. New foreign business in tin plate has subsided, but shipments against orders taken before the market advanced are still heavy. Imports are becoming more of a problem in this district. French and Belgian bars have been selling here at 1.60c. to 1.65c. a lb., duty paid, delivered New York harbor, but are not moving so well at the moment because of monetary uncertainty abroad. German steel can be bought at even lower prices, but those who handle foreign steel in this market will not, in many cases, buy from Germany. Small fabricating shops in this district are not only using more foreign steel but

are employing an increasing amount of second-hand material.

Pig Iron

With all prices reaffirmed for first quarter, sellers are looking forward to the development of a fair amount of business next week. Not only is the firm appearance of prices expected to encourage more forward buying, but the excellent manner in which current shipments are holding up is considered an indication that many foundry stocks are being depleted. The aggregate foundry melt of this area is holding its gain over September activity, and observers believe that operations will be maintained or even advanced slightly over the next two months. New bookings last week totaled 1950 tons, as compared with 750 tons in the preceding seven-day period and 1000 tons sold two weeks earlier. The Troy stack is expected to go out of blast late this week or early next.

Reinforcing Steel

The foundation for the New York Federal Building, calling for 500 tons, has been sublet to the George J. Atwell Co., and 800 tons for the superstructure will probably soon be purchased. The Kalman Steel Corp. will furnish 275 tons of mesh for highway work in Orange and Westchester Counties, N. Y., and Igoe Brothers was awarded 250 tons for Pier No. 32 at New York. In addition, Carroll-McCreary Co. was awarded 120 tons for an immigrant station on Ellis Island, N. Y. Pending awards include around 400 tons to be let by New York State on Dec. 4, and 650 tons for additional Triborough bridge piers to come out Dec. 4.

Scrap

Tendencies toward general price firmness have definitely come to a head, and leading brokers are now paying \$8.50 and \$7 a ton for No. 1 and No. 2 steels respectively for small barge deliveries. The upward price trend has also been reflected in less active grades. All cast scrap is uniformly 25c. a ton higher, and unprepared yard iron and steel is now being purchased in trucklots at \$4 to \$4.50. Likewise rerolling rails and

stove plate are \$1 higher, and various cast grades for delivery to local foundries have advanced 25c. a ton. A little cast and stove plate is being shipped to nearby foundries, but otherwise brokers are concentrating as usual on the coverage of export contracts. A number of boats are loading steel and some cast is being loaded on barges. Although broker coverage is currently as heavy as last month, not very much new foreign business is being accepted at present. With the domestic market uniformly strong all over the country, sellers are hesitant about the making of new commitments until they are more sure as to the January-February position of scrap.

Cast Pipe Active In South

BIRMINGHAM, Nov. 27.—Foundries continue to buy pig iron mostly in small lots for immediate delivery. Books for the first quarter will be opened Dec. 1 and it is indicated that the prevailing price of \$14.50 will be reaffirmed. At this time there is no interest in first quarter tonnage.

The active blast furnace total will drop back to four this week after having been temporarily increased last week to five. Fairfield furnace No. 6 of the Tennessee company, banked for some time, was operated again last week to prepare for re-banking.

The condition of the steel market is about as it has been for the past two months, with some activity in sheets and wire products and very little in heavier products.

Five open-hearths will be operated this week, as compared with four last week. For the second successive week the open-hearth plant of the Gulf States Steel Co. will be completely idle. It is expected that the Ensley rail mill will reopen Dec. 10 for a week's run.

PWA business continues to give strength to the pressure pipe market. This tonnage, nearly a year overdue, is expected to provide the pipe market with favorable business during the winter months, when the sharpest sag usually develops.

November lettings were more numerous than in October and the tonnage placed for delivery in the next 45 to 60 days was also larger. Actual shipments in November were about the same as in October. The December outlook is also encouraging.

Last week Pensacola awarded 1600 tons to the American Cast Iron Pipe Co., the largest order placed this month in the Southeast. Among other awards were 425 tons by Fairhope, Ala., to the National Cast Iron Pipe Co. and 500 tons by Clinton, S. C., to the American Cast Iron Co.

Four 300-Ton Cranes for Boulder Dam On Display at Harnischfeger Anniversary

IN commemorating its fiftieth anniversary, the Harnischfeger Corp., Milwaukee, recently opened its shop to visitors who inspected in detail the four 300-ton cranes that are being built for use at Boulder Dam. Also on display were such standard products of the corporation as welding equipment, hoists, excavating machinery, etc.

One of the 300-ton cranes was completely assembled on the shop floor. The other cranes were in various stages of completion. Each of these cranes will have a span of 64 ft. and a lift of 50 ft. Girder weight is 70,000 lb. and trolley weight 135,000 lb. The total weight of a crane is 450,000 lb. Top plates on the girders are 2 in. thick. The eight motors are rated at 410 hp. and about one mile of 1½-in. steel cable is used on each crane. Main hoist drums have 150-ton capacity and each of the auxiliary hoists on each trolley is rated at 30 tons. The main drums are made of semi-steel and each drum weighs 27,000 lb., or 54,000 lb. per crane.

These are 16-wheel cranes that are driven on both sides by two 60 hp. motors. The spread on the trolley is 16 ft. 6 in. All trolley sides are of welded steel construction and all steel floor plates are welded end to end. Rolled steel wheels are used throughout. All motors are under full magnetic switch controls which were furnished by Cutler-Hammer, Inc., Milwaukee. All motors were made by the Harnischfeger Corp., as were all magnetic brakes and the fully enclosed spur reduction gears. Motors are designed for alternating current, 3 phase, 440 volts and 60 cycles. Con-

ductors are made of rolled steel angle bars.

These cranes will be used in the turbo-generator room of the Boulder Dam power plant. Two cranes paired together will be required to lift a turbine motor which weighs about 600 tons. Lift beams for this hook-up are being furnished by the Harnischfeger Corp. One 300-ton lift beam is provided for each crane thereby tying together the two main hoist drums on each crane. Then a 600-ton lift beam is swung between the two 300-ton beams. The forged yoke for the 600-ton beam weighs 12,000 lb., finished.

Commercial Regulations And Resolutions Revised

THE directors of the American Iron and Steel Institute have amended Commercial Resolution No. A32, relating to delivered prices on certain kinds of wire products sold for delivery in and around Anderson, Ind. The products on which deductions in price are now permissible are defined in the revised resolution as "manufacturers' wire of Bessemer or of open-hearth process steel with a carbon content not exceeding 0.4 per cent, 22 gage or coarser, round in shape, in coiled or in straightened and cut form and of either bright and/or annealed and/or galvanized finish." Heretofore the deductions applied on quantities of a carload or more, but this qualification is no longer included. The amended resolution was effective Nov. 23.

The definition of a jobber in the institute's Commercial Regulations No. 1 has been amended slightly by the inclusion of machine straightening of wire products under the terms "processing" and "fabricating." As before the terms do not include cutting to length or size or bending. The jobbers' agreement form has been similarly amended.

State or municipal governments and departments thereof, in addition to the Federal Government and its departments, come under the definition of jobbers of wire products, following an amendment to regulations 3, which is effective Nov. 20.

Navy Allocates Bars For 8 Destroyers

WASHINGTON, Nov. 27.—The Navy Department has distributed 348 tons of steel bars for eight destroyers as follows: Pacific Coast Steel Co., 130½ tons; Ross Galvanizing Co., 75 tons; Bethlehem Steel Co., 62½ tons; Penn Galvanizing Co., 42½ tons and Superior Steel Co., 37½ tons. Three of the destroyers are being built at the Norfolk navy yard, two at the Puget Sound yard, two at the Boston yard and one at the Mare Island yard. Bids for the bars were opened Nov. 2.

Management Societies to Hold Combined Conference

THE first annual conference of the Federated Management Societies, including the Taylor Society, Inc., and the Society of Industrial Engineers, and cooperating with the management section of the American Society of Mechanical Engineers and the Stevens Institute of Technology, will be held at the Hotel Astor, New York, Dec. 6 and 7. Sessions will also be held at the Engineering Societies Building, 29 West Thirty-ninth Street, New York, and at the Stevens Institute, Hoboken, N. J.

Highlights of the comprehensive program include a talk on "Fundamentals for Recovery in the Durable Goods Industries," by George H. Houston, president, Baldwin Locomotive Works, Philadelphia, and chairman, Durable Goods Industries Committee; a paper on the "Politics of Planning," by Dr. H. S. Person, New York, consultant on business economics and management, and an address on the "Opportunity for Technical Advances under the New Deal," by Willard L. Thorp, consumers' division, National Emergency Council, Washington.

Programs are available at 29 West Thirty-ninth Street, New York.



One of the four 300-ton cranes that will operate in the Boulder Dam power house.

Prices of Finished Steel and Iron Products

BARS, PLATES, SHAPES

Iron and Steel Bars	
Soft Steel	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Gary	1.85c.
F.o.b. Duluth	1.85c.
Del'd Detroit	1.95c.
F.o.b. Cleveland	1.85c.
F.o.b. Buffalo	1.90c.
Del'd Philadelphia	2.00c.
Del'd New York	2.13c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.

Rail Steel	
(For merchant trade)	
F.o.b. Pittsburgh	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Gary	1.75c.
F.o.b. Moline, Ill.	1.75c.
F.o.b. Cleveland	1.75c.
F.o.b. Buffalo	1.80c.
F.o.b. Birmingham	1.85c.
F.o.b. cars dock Gulf ports	2.10c.
F.o.b. cars dock Pacific ports	2.25c.

Billet Steel Reinforcing	
(Straight lengths as quoted by distributors)	
F.o.b. Pittsburgh	2.05c.
F.o.b. Chicago	2.10c.
F.o.b. Gary	2.10c.
Del'd Detroit	2.20c.
F.o.b. Cleveland	2.10c.
F.o.b. Youngstown	2.10c.
F.o.b. Buffalo	2.10c.
F.o.b. Birmingham	2.10c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.45c.

Rail Steel Reinforcing	
(Straight lengths as quoted by distributors)	
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago	1.95c.
F.o.b. Gary	1.95c.
F.o.b. Cleveland	1.95c.
F.o.b. Youngstown	1.95c.
F.o.b. Buffalo	1.95c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. cars dock Pacific ports	2.30c.

Iron	
F.o.b. Chicago	1.80c.
F.o.b. Terre Haute, Ind.	1.75c.
F.o.b. Louisville, Ky.	2.10c.
F.o.b. Danville, Pa.	1.80c.
F.o.b. Berwick, Pa.	1.80c.

Cold Finished Bars and Shafting*	
Base per Lb.	
F.o.b. Pittsburgh	2.15c.
F.o.b. Chicago	2.15c.
F.o.b. Gary	2.15c.
F.o.b. Cleveland	2.15c.
F.o.b. Buffalo	2.20c.
Del'd Detroit	2.30c.
Del'd eastern Michigan	2.35c.

* In quantities of 10,000 to 19,000 lb.

Fence and Sign Posts	
Angle Line Posts	Base per Net Ton
F.o.b. Pittsburgh	\$50.00
F.o.b. Chicago	50.00
F.o.b. Duluth	51.00
F.o.b. Cleveland	50.00
F.o.b. Birmingham	53.00
F.o.b. Houston, Orange, Beaumont, Galveston	59.00
F.o.b. Mobile	58.00
F.o.b. New Orleans, Lake Charles, Corpus Christi	59.00
F.o.b. cars dock Pacific ports	63.00

Plates	
Base per Lb.	
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Gary	1.85c.
Del'd Cleveland	1.985c.
F.o.b. Coatesville	1.90c.
F.o.b. Sparrows Point	1.90c.
Del'd Philadelphia	1.985c.
Del'd New York	2.08c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.
Wrought iron plates, f.o.b. P'gh.	2.30c.

Floor Plates	
F.o.b. Pittsburgh	3.35c.
F.o.b. Chicago	3.40c.
F.o.b. Coatesville	3.45c.
F.o.b. cars dock Gulf ports	3.75c.
F.o.b. cars dock Pacific ports	3.90c.

Structural Shapes	
Base per Lb.	
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
Del'd Cleveland	1.985c.
F.o.b. Buffalo	1.90c.
F.o.b. Bethlehem	1.90c.
Del'd Philadelphia	2.05c.
Del'd New York	2.05c.
F.o.b. Birmingham (standard)	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.15c.
F.o.b. Chicago	2.25c.
F.o.b. Buffalo	2.25c.
F.o.b. cars dock Gulf ports	2.60c.
F.o.b. cars dock Pacific ports	2.60c.

SHEETS, STRIP, TIN PLATE

TERNE PLATE	
Sheets	
Hot Rolled	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.85c.
No. 10, f.o.b. Gary	1.95c.
No. 10, del'd Detroit	2.05c.
No. 10, del'd Phila.	2.10c.
No. 10, f.o.b. Birmingham	2.00c.
No. 10, f.o.b. dock cars Pacific ports	2.40c.

Hot-Rolled Annealed	
No. 24, f.o.b. Pittsburgh	2.40c.
No. 24, f.o.b. Gary	2.50c.
No. 24, del'd Detroit	2.60c.
No. 24, del'd Phila.	2.60c.
No. 24, f.o.b. Birmingham	2.55c.
No. 24, f.o.b. dock cars Pacific ports	3.05c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled	
No. 10 gage, f.o.b. Pittsburgh	2.50c.
No. 10 gage, f.o.b. Gary	2.60c.
No. 10 gage, del'd Detroit	2.70c.
No. 10 gage, del'd Phila.	2.70c.
No. 10 gage, f.o.b. Birmingham	2.55c.
No. 10 gage, f.o.b. dock cars Pacific ports	3.10c.

Light Cold-Rolled	
No. 20 gage, f.o.b. Pittsburgh	2.95c.
No. 20 gage, f.o.b. Gary	3.05c.
No. 20 gage, del'd Detroit	3.15c.
No. 20 gage, del'd Phila.	3.24c.
No. 20 gage, f.o.b. Birmingham	3.10c.
No. 20 gage, f.o.b. dock cars Pacific ports	3.50c.

Galvanized Sheets	
No. 24, f.o.b. Pittsburgh	3.10c.
No. 24, f.o.b. Gary	3.20c.
No. 24, del'd Phila.	3.39c.
No. 24, f.o.b. Birmingham	3.25c.
No. 24, f.o.b. dock cars Pacific ports	3.70c.
No. 24, wrought iron, Pittsburgh	4.95c.

Long Ternes	
No. 24, unassorted 8-lb. coating	3.40c.
f.o.b. Pittsburgh	3.40c.
F.o.b. cars dock Pacific ports	4.10c.

Vitrous Enameling Stock	
No. 20, f.o.b. Pittsburgh	3.10c.

Tin Mill Black Plate	
No. 28, f.o.b. Pittsburgh	2.75c.
No. 28, Gary	2.85c.
No. 28, cars dock, Pacific Coast ports	3.35c.

Tin Plate	
Per Base Box	
Standard cokes, f.o.b. P'gh district mill	\$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate	
(F.o.b. Pittsburgh)	
(Per Package, 20 x 28 in.)	
8-lb. coating I.C.	\$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under 1/4 in.	
Base per Lb.	
All widths up to 24 in., P'gh.	1.85c.
All widths up to 24 in., Chicago	1.95c.
All widths up to 24 in., del'd Detroit	2.05c.
All widths up to 24 in., Birmingham	2.00c.
Cooperage stock, Pittsburgh	2.10c.
Cooperage stock, Chicago	2.20c.

Cold-Rolled Strips	
Base per Lb.	
F.o.b. Pittsburgh	2.60c.
F.o.b. Cleveland	2.60c.
F.o.b. Chicago	2.85c.
F.o.b. Worcester	2.90c.

Fender Stock	
No. 14, Pittsburgh or Cleveland	2.90c.
No. 14, Worcester	3.30c.
No. 20, Pittsburgh or Cleveland	3.30c.
No. 20, Worcester	3.70c.

Hot-Rolled Rail Steel Strips	
Base per Lb.	
F.o.b. Pittsburgh	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Birmingham	1.85c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade	
Per Lb.	
Bright wire	2.30c.
Spring wire	2.90c.

Chicago prices on products sold to the manufacturing trade are \$1 a ton above Pittsburgh or Cleveland. Worcester prices are \$2 a ton above, and Pacific Coast prices \$3 a ton above.

To Jobbing Trade	
Per Lb.	
Qualified jobbers are entitled to a reduction of 20c. a 100 lb. from the base price on carload shipments to stock, and of 10c. a 100 lb. on less-carload shipments to stock.	

Base per Keg	
Standard wire nails	\$2.60
Smooth coated nails	2.60
Galvanized nails:	
15 gage and coarser	4.60
16 gage and finer	5.10

Base per 100 Lb.	
Annealed fence wire	\$2.45
Galvanized fence wire	2.60
Polished staples	3.30
Galvanized staples	3.55
Barbed wire, galvanized	3.00
Woven wire fence, base column	63.00

Chicago and Anderson, Ind., mill prices are \$1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is \$2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are \$2 a ton over Pittsburgh (except for woven wire fence at Duluth which is \$3 over Pittsburgh), and Birmingham mill prices are \$3 a ton over Pittsburgh.

On manufacturers' wire prices at Pacific ports are \$2 above the Pittsburgh base. On high-carbon spring wire, prices at Pacific ports are also \$2 above Pittsburgh. On wire nails, barbed wire, staples and fence wire, prices at Houston, Galveston and Corpus Christi are \$6 a ton over Pittsburgh, while New Orleans and Pacific Coast prices are \$8 over Pittsburgh. Exception: on fence wire Pacific Coast prices are \$11 a ton above Pittsburgh.

Wire Hoops, Twisted or Welded	
Off List	
F.o.b. Pittsburgh	35 and 2 1/2 off
F.o.b. Chicago	35 off

Bale Ties, Single Loop	
Base per Net Ton	
F.o.b. Pittsburgh	\$63.00
F.o.b. Chicago	64.00
F.o.b. Duluth	65.00
F.o.b. Cleveland	68.00
F.o.b. Birmingham	66.00
F.o.b. cars dock Houston, Galveston, Beaumont, Orange or Corpus Christi, Tex.	72.00
F.o.b. cars dock Pacific ports	74.00

STEEL AND WROUGHT PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld	
Inches	Black Galv.
1/2	51 1/2
3/4	53 1/2
1	55 1/2
1 1/4	57 1/2
1 1/2	58 1/2
1 3/4	60 1/2
2	62 1/2
2 1/4	64 1/2
2 1/2	65 1/2
2 3/4	67 1/2
3	69 1/2
3 1/4	71 1/2
3 1/2	72 1/2
3 3/4	74 1/2
4	76 1/2
4 1/4	78 1/2
4 1/2	79 1/2
4 3/4	81 1/2
5	83 1/2
5 1/4	85 1/2
5 1/2	86 1/2
5 3/4	88 1/2
6	90 1/2
6 1/4	92 1/2
6 1/2	93 1/2
6 3/4	95 1/2
7	97 1/2
7 1/4	99 1/2
7 1/2	100 1/2
7 3/4	102 1/2
8	104 1/2
8 1/4	106 1/2
8 1/2	107 1/2
8 3/4	109 1/2
9	111 1/2
9 1/4	113 1/2
9 1/2	114 1/2
9 3/4	116 1/2
10	118 1/2
10 1/4	120 1/2
10 1/2	121 1/2
10 3/4	123 1/2
11	125 1/2
11 1/4	127 1/2
11 1/2	128 1/2
11 3/4	130 1/2
12	132 1/2
12 1/4	134 1/2
12 1/2	135 1/2
12 3/4	137 1/2
13	139 1/2
13 1/4	141 1/2
13 1/2	142 1/2
13 3/4	144 1/2
14	146 1/2
14 1/4	148 1/2
14 1/2	149 1/2
14 3/4	151 1/2
15	153 1/2
15 1/4	155 1/2
15 1/2	156 1/2
15 3/4	158 1/2
16	160 1/2
16 1/4	162 1/2
16 1/2	163 1/2
16 3/4	165 1/2
17	167 1/2
17 1/4	169 1/2
17 1/2	170 1/2
17 3/4	172 1/2
18	174 1/2
18 1/4	176 1/2
18 1/2	177 1/2
18 3/4	179 1/2
19	181 1/2
19 1/4	183 1/2
19 1/2	184 1/2
19 3/4	186 1/2
20	188 1/2
20 1/4	190 1/2
20 1/2	191 1/2
20 3/4	193 1/2
21	195 1/2
21 1/4	197 1/2
21 1/2	198 1/2
21 3/4	200 1/2
22	202 1/2
22 1/4	204 1/2
22 1/2	205 1/2
22 3/4	207 1/2
23	209 1/2
23 1/4	211 1/2
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23 3/4	214 1/2
24	216 1/2
24 1/4	218 1/2
24 1/2	219 1/2
24 3/4	221 1/2
25	223 1/2
25 1/4	225 1/2
25 1/2	226 1/2
25 3/4	228 1/2
26	230 1/2
26 1/4	232 1/2
26 1/2	233 1/2
26 3/4	235 1/2
27	237 1/2
27 1/4	239 1/2
27 1/2	240 1/2
27 3/4	242 1/2
28	244 1/2
28 1/4	246 1/2
28 1/2	247 1/2
28 3/4	249 1/2
29	251 1/2
29 1/4	253 1/2
29 1/2	254 1/2
29 3/4	256 1/2
30	258 1/2
30 1/4	260 1/2
30 1/2	261 1/2
30 3/4	263 1/2
31	265 1/2
31 1/4	267 1/2
31 1/2	268 1/2
31 3/4	270 1/2
32	272 1/2
32 1/4	274 1/2
32 1/2	275 1/2
32 3/4	277 1/2
33	279 1/2
33 1/4	281 1/2
33 1/2	282 1/2
33 3/4	284 1/2
34	286 1/2
34 1/4	288 1/2
34 1/2	289 1/2
34 3/4	291 1/2
35	293 1/2
35 1/4	295 1/2
35 1/2	296 1/2
35 3/4	298 1/2
36	300

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine bolts	70, 10, 10 and 14
Carriage bolts	70, 10, 10 and 14
Lag bolts	70, 10, 10 and 14
Flange bolts, Nos. 1, 2, 3 and 7	70, 10, 10 and 14
Hot-pressed nuts, blank or tapped	70, 10, 10 and 14
Hot-pressed nuts, blank or tapped	70, 10, 10 and 14
Hexagons	70, 10, 10 and 14
C.p.c. and t. square or hex. nuts	70, 10, 10 and 14
Blank or tapped	70, 10, 10 and 14
Semi-finished hexagon nuts, U.S.S.	all sizes
Semi-finished hexagon nuts, S.A.E.	all sizes
1/4 in. to 7/16 in. diameter	70, 10, 10 and 14
1/2 in. to 1 in. diameter	70, 10, 10 and 14
larger than 1 in. diameter	70, 10, 10 and 14
Store bolts in packages, Pittsburgh	75
Store bolts in packages, Chicago	75
Store bolts in packages, Cleveland	75
Store bolts in bulk, Pgh.	83
Store bolts in bulk, Chicago	83
Store bolts in bulk, Cleveland	83
Tire bolts	60 and 10

Large Rivets
(1/2-in. and larger)
Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland.....\$2.90
F.o.b. Chicago.....3.00
F.o.b. Birmingham.....3.05

Small Rivets
(7/16-in. and smaller)
F.o.b. Pittsburgh.....70 and 5
F.o.b. Cleveland.....70 and 5
F.o.b. Chicago and Birm'g'm.....70 and 5

Cap and Set Screws
(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)
Per Cent Off List
Milled cap screws, 1 in. dia. and smaller.....85
Milled standard set screws, case hardened, 1 in. dia. and smaller.....75 and 10
Milled headless set screws, cut thread 1/4 in. and smaller.....75 and 10
Unset hex. head cap screws, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller.....85 and 10
Unset set screws, cut and oval point.....80
Milled studs.....65 and 10

Alloy and Stainless Steel
F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Uncropped.....\$40 per gross ton

Alloy Steel Blooms, Billets and Slabs
F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, \$49 a gross ton.
Price del'd Detroit is \$52.

Alloy Steel Bars
F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base.....2.45c.
Delivered price at Detroit is.....2.60c.
S.A.E. Alloy Differential per 100 lb.
Numbers

2000 (1/4% Nickel)	0.25
2100 (2/4% Nickel)	0.55
2200 (3/4% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
4100 Chromium Vanadium Bar	1.20
4100 Chromium Vanadium Spring Steel	0.95
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is 1/4c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2 1/2 in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Alloy Cold-Finished Bars
F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 2.95c. base per lb.

STAINLESS STEEL No. 302
(17 to 19% Cr. 7 to 9% Ni, 0.08 to 0.20% C)
(Base Prices, f.o.b. Pittsburgh)

Forging billets	Per Lb. 19.55c.
Bars	23c.
Plates	26c.
Sheets	33c.
Hot-rolled strip	30 1/2c.
Cold-rolled strip	27c.
Drawn wire	23c.

Raw and Semi-Finished Steel

Carbon Steel Re-rolling Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.
Uncropped.....\$29 per gross ton

Carbon Steel Forging Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.
Uncropped.....\$31 per gross ton

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.
Per Gross Ton \$27.00

Re-rolling.....32.00
Forging quality.....32.00

Delivered Detroit
Re-rolling.....\$30.00
Forging.....35.00

Billets Only F.o.b. Duluth
Re-rolling.....\$29.00
Forging.....34.00

Sheet Bars

F.o.b. Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.
Per Gross Ton \$28.00

Open-hearth or Bessemer.....\$28.00

Skelp

F.o.b. Pittsburgh, Chicago, Youngstown, Buffalo, Coatesville, Pa., Sparrows Point, Md.
Per Lb.
Grooved.....1.70c.
Universal.....1.70c.
Sheared.....1.70c.

Tube Rounds

Base per Lb.
F.o.b. Pittsburgh.....1.80c.
F.o.b. Chicago.....1.85c.
F.o.b. Cleveland.....1.85c.
F.o.b. Buffalo.....1.85c.
F.o.b. Birmingham.....1.95c.

Wire Rods

(Common soft, base)

Per Gross Ton
F.o.b. Pittsburgh.....\$33.00
F.o.b. Cleveland.....38.00
F.o.b. Chicago.....39.00
F.o.b. Anderson, Ind.....39.00
F.o.b. Youngstown.....39.00
F.o.b. Worcester, Mass.....40.00
F.o.b. Birmingham.....41.00
F.o.b. San Francisco.....47.00
F.o.b. Galveston.....44.00

Pig Iron and Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	\$19.50	\$20.00	\$19.00	\$20.50
Bethlehem, Pa.	19.50	20.00	19.00	20.50
Birdsboro, Pa.	19.50	20.00	19.00	20.50
Swedeland, Pa.	19.50	20.00	19.00	20.50
Steelton, Pa.	19.50	20.00	19.00	20.50
Sparrows Point, Md.	19.50	20.00	19.00	20.50
Neville Island, Pa.	18.50	18.50	18.00	19.00
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Youngstown	18.50	18.50	18.00	19.00
Buffalo	18.50	19.00	18.00	19.50
Erie, Pa.	18.50	19.00	18.00	19.50
Cleveland	18.50	18.50	18.00	19.00
Toledo, Ohio	18.50	18.50	18.00	19.00
Jackson, Ohio	20.25	20.25	19.75	20.25
Detroit	18.50	18.50	18.00	19.00
Hamilton, Ohio	18.50	18.50	18.00	19.00
Chicago	18.50	18.50	18.00	19.00
Granite City, Ill.	18.50	19.00	18.00	19.50
Duluth, Minn.	19.00	19.00	18.50	19.00
Birmingham	14.50	14.50	13.50	14.50
Provo, Utah	17.50	17.50	16.50	17.50

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District	\$20.00	\$20.50	\$19.50	\$21.00
From Everett, Mass.	21.77	22.27	21.27	22.77
Brooklyn	20.89	21.39	20.39	21.89
From East Pa. or Buffalo	20.26	20.76	19.76	21.26
Newark or Jersey City, N. J.	19.51	19.51	19.01	20.01
From East Pa. or Buffalo	19.76	19.76	19.26	20.26
Philadelphia	20.50	20.50	19.50	20.50
From Eastern Pa.	20.26	20.26	19.26	20.26
Cincinnati	20.77	20.77	19.77	20.77
From Hamilton, Ohio	20.55	20.55	19.55	20.55
Canton, Ohio	19.50	19.50	18.50	19.50
From Cleveland and Youngstown	20.94	20.94	19.94	20.94
Columbus, Ohio	20.26	20.26	19.26	20.26
From Hamilton, Ohio	20.77	20.77	19.77	20.77
Mansfield, Ohio	20.26	20.26	19.26	20.26
From Cleveland and Toledo	20.77	20.77	19.77	20.77
Indianapolis	20.55	20.55	19.55	20.55
From Hamilton, Ohio	19.50	19.50	18.50	19.50
South Bend, Ind.	20.94	20.94	19.94	20.94
From Chicago	20.26	20.26	19.26	20.26
Milwaukee	21.04	21.04	20.04	21.04
From Chicago	20.26	20.26	19.26	20.26
St. Paul	20.26	20.26	19.26	20.26
From Duluth	20.26	20.26	19.26	20.26
Davenport, Iowa	20.26	20.26	19.26	20.26
From Chicago	20.26	20.26	19.26	20.26
Kansas City	21.04	21.04	20.04	21.04
From Granite City	20.26	20.26	19.26	20.26

Delivered prices on Southern Iron for shipment to Northern points are 33c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.....\$23.50
Johnson City, Tenn.....23.50
Del'd Chicago.....29.15

GRAY FORCE PIG IRON

Valley furnace.....\$18.00
Pittsburgh district furnace.....18.00

CHARCOAL PIG IRON

Lake Superior furnace.....\$21.00
Delivered Chicago.....24.04
Delivered Buffalo.....24.28

CANADA

Pig Iron

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75.....\$21.00
No. 2 fdy., sil. 1.75 to 2.75.....20.50
Malleable.....21.00

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75.....\$22.50
No. 2 fdy., sil. 1.75 to 2.25.....22.00
Malleable.....22.50
Basic.....22.50

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.
Per Gross Ton
Domestic, 80% (carload).....\$35.00

Spiegeleisen

Per Gross Ton Furnace
Domestic, 19 to 21%.....\$26.00

Electric Ferrosilicon

Per Gross Ton Delivered
50% (carloads).....\$77.50
50% (ton lots).....85.00
75% (carloads).....122.00
75% (ton lots).....136.00
14% to 16% (f.o.b.) Welland, Ont. (in carloads) (duty paid).....31.00
14% to 16% (less carloads).....38.50

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton	Per Gross Ton
6%.....\$22.75	12%.....\$29.25
7%.....23.75	13%.....30.75
8%.....24.75	14%.....32.25
9%.....25.75	15%.....33.75
10%.....26.75	16%.....35.25
11%.....27.75	17%.....36.75

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are \$1.25 a ton higher than at Jackson.

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton	Per Gross Ton
10%.....\$27.75	14%.....\$33.25
11%.....28.75	15%.....34.75
12%.....29.75	16%.....36.25
13%.....30.75	17%.....37.75

Manganese 1 1/2 to 3%, \$1 a ton additional. For each unit of manganese over 3% \$1 a ton additional. Phosphorus 0.75% or over, \$1 ton additional.

Base prices at Buffalo are \$1.25 a ton higher than at Jackson.

Other Ferroalloys

Ferrotungsten, per lb. contained W, del., carloads.....\$1.35 to \$1.45
Ferrotungsten, less carloads, 1.45 to 1.55
Ferrocromium, 4 to 6% carbon and up to 70% Cr. per lb. contained Cr. delivered, in carloads.....10.00c.
Ferrocromium, 2% carbon.....16.50c. to 17.00c.
Ferrocromium, 1% carbon.....17.50c. to 18.00c.
Ferrocromium, 0.10% carbon.....19.50c. to 20.00c.
Ferrocromium, 0.06% carbon.....20.00c. to 20.50c.
Ferrocromium, del., per lb. contained V.....\$2.70 to \$2.90
Ferrocobalt, 15 to 18% Ti, 5 to 8% C, f.o.b. furnace carload and contract per net ton \$137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with \$2 unitage.....50.00
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton with \$2.75 unitage.....65.00
Ferromolybdenum, per lb. Mo., del. 95c.
Calcium molybdate, per lb. Mo., del.....80c.
Silico spiegel, per ton, f.o.b. furnace, car lots.....\$38.00
Ton lots or less per ton.....45.50
Silico-manganese, gross ton, delivered:
2.50% carbon grade.....90.00
2% carbon grade.....95.00
1% carbon grade.....105.00
Spot prices.....\$5 a ton higher

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$11.00 to \$11.50
No. 2 heavy melting steel	10.00 to 10.50
No. 2 railroad wrought	11.00 to 11.50
Scrap rails and under	11.00 to 11.50
Rails 3 ft. and under	11.00 to 11.50
Compressed sheet steel	11.00 to 11.50
Hand bundled sheet steel	10.00 to 10.50
Hvy. steel axle turnings	9.00 to 9.50
Machine shop turnings	7.50 to 8.00
Short shov. turnings	7.50 to 8.00
Short mixed borings and turnings	5.25 to 5.75
Cast iron borings	5.25 to 5.75
Cast iron car wheels	11.50 to 12.00
Heavy breakable cast	10.00 to 10.50
No. 1 cast	11.25 to 11.75
Rail. knuckles and couplers	14.00 to 14.50
Rail. coil and leaf springs	14.00 to 14.50
Roller steel wheels	14.00 to 14.50
Low phos. billet crops	14.25 to 14.75
Low phos. sheet bar crops	14.25 to 14.75
Low phos. plate scrap	13.00 to 13.50
Low phos. punchings	13.50 to 14.00
Steel car axles	13.00 to 13.50

CHICAGO

Delivered Chicago district consumers: Per Gross Ton	
Heavy melting steel	\$9.25 to \$9.75
Automobile hvy. melt. steel	8.00 to 8.50
Shoveling steel	9.25 to 9.75
Hydraulic comp. sheets	8.50 to 9.00
Drop forge flashings	8.25 to 8.75
No. 1 busheling	8.25 to 8.75
Roller wheels	10.75 to 11.25
Railroad leaf springs	10.75 to 11.25
Steel couplers and knuckles	10.50 to 11.00
Coil springs	11.00 to 11.50
Steel axles (elec. fur.)	8.50 to 9.00
Low phos. punchings	11.00 to 11.50
Low phos. plates, 12 in. and under	11.00 to 11.50
Cast iron borings	5.25 to 5.75
Short shoveling turnings	5.25 to 5.75
Machine shop turnings	4.50 to 5.00
Rolling rails	10.25 to 10.75
Steel rails, less than 3 ft.	10.75 to 11.25
Steel rails, less than 2 ft.	11.50 to 12.00
Angle bars, steel	10.00 to 10.50
Cast iron car wheels	10.00 to 10.50
Railroad malleable	9.50 to 10.00
Agricultural malleable	8.00 to 8.50

Per Net Ton

Iron car axles	\$13.50 to \$14.00
Steel car axles	12.50 to 13.00
No. 1 railroad wrought	8.75 to 9.25
No. 2 railroad wrought	8.50 to 9.00
No. 2 busheling	5.00 to 5.50
Locomotive tires, smooth	9.50 to 10.00
Pipe and flues	5.00 to 5.50
No. 1 machinery cast	8.50 to 9.00
Clean automobile cast	9.50 to 10.00
No. 1 railroad cast	7.50 to 8.00
No. 1 agricultural cast	7.50 to 8.00
Store plate	5.25 to 5.75
Gate bars	5.25 to 5.75
Brake shoes	6.00 to 6.50

PHILADELPHIA

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$10.00 to \$10.50
No. 2 heavy melting steel	8.50 to 9.00
No. 1 railroad wrought	11.00 to 11.50
Bundled sheets	9.50 to 10.00
Hydraulic compressed, new	6.50 to 7.00
Hydraulic compressed, old	5.00 to 5.50
Machine shop turnings	8.50 to 9.00
Heavy axle turnings	8.00 to 8.50
Cast borings	10.00 to 10.50
Heavy breakable cast	8.00 to 8.50
Store plate (steel works)	13.00 to 13.50
No. 1 low phos. heavy	13.00 to 13.50
Couplers and knuckles	13.00 to 13.50
Hollow steel wheels	5.00 to 5.50
No. 1 blast furnace	16.00 to 16.50
Spec. iron and steel pipe	15.00 to 15.50
Shafting	15.00 to 15.50
Steel axles	15.00 to 15.50
No. 1 forge fire	10.50 to 11.00
Cast iron car wheels	10.50 to 11.00
No. 1 cast	10.50 to 11.00
Cast borings (chem.)	12.00 to 12.50
Steel rails for rolling	12.00

CINCINNATI

Dealers' buying prices per gross ton:	
Heavy melting steel	\$7.25 to \$7.75
Scrap rails for melting	8.50 to 9.00
Loose sheet clippings	4.00 to 4.50
Bundled sheets	6.00 to 6.50
Cast iron borings	4.50 to 5.00
Machine shop turnings	4.50 to 5.00
No. 1 busheling	6.00 to 6.50
No. 2 busheling	2.75 to 3.25
Rails for rolling	9.00 to 9.50
No. 1 locomotive tires	8.50 to 9.00
Short rails	11.50 to 12.00
Cast iron car wheels	8.00 to 8.50
No. 1 machinery cast	9.25 to 9.75
No. 1 railroad cast	8.50 to 9.00
Burnt cast	6.00 to 6.50
Store plate	6.00 to 6.50
Agricultural malleable	8.00 to 8.50
Railroad malleable	8.25 to 8.75

CLEVELAND

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$8.50 to \$9.00
No. 2 heavy melting steel	8.00 to 8.50
Compressed sheet steel	7.25 to 7.75
Light bundled sheet stampings	6.50 to 7.00
Drop forge flashings	7.50 to 8.00
Machine shop turnings	6.00 to 6.50
Short shoveling turnings	6.50 to 7.00
No. 1 busheling	7.50 to 8.00
Steel axle turnings	7.50 to 8.00
Low phos. billet crops	12.50 to 13.00
Cast iron borings	6.25 to 6.75
Mixed borings and short turnings	6.25 to 6.75
No. 2 busheling	6.25 to 6.75
No. 1 cast	10.50 to 11.00
Railroad grate bars	7.00 to 7.50
Store plate	6.50 to 7.00
Rails under 3 ft.	12.50 to 13.00
Rails for rolling	15.50 to 16.00
Railroad malleable	11.50 to 12.00
Cast iron car wheels	9.75 to 10.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:	
No. 1 heavy melting steel	\$10.00 to \$10.50
No. 2 heavy melting steel	8.75 to 9.25
Scrap rails	8.50 to 9.00
New hydraulic comp. sheets	8.75 to 9.25
Old hydraulic comp. sheets	7.50 to 8.00
Drop forge flashings	8.75 to 9.25
No. 1 busheling	8.75 to 9.25
Hvy. steel axle turnings	6.50 to 7.00
Machine shop turnings	5.00 to 5.50
Knuckles and couplers	12.00 to 12.50
Coil and leaf springs	12.00 to 12.50
Roller steel wheels	12.00 to 12.50
Low phos. billet crops	11.75 to 12.25
Short shov. steel turnings	5.50 to 6.00
Short mixed borings and turnings	5.50 to 6.00
Cast iron borings	5.50 to 6.00
No. 2 busheling	5.00 to 5.50
Steel car axles	10.50 to 11.00
Iron axles	10.50 to 11.00
No. 1 cupola cast	11.00 to 11.50
No. 1 machinery cast	8.00 to 8.50
Store plate	8.75 to 9.25
Steel rails, 3 ft. and under	12.00 to 12.50
Cast iron car wheels	10.00 to 10.50
Industrial malleable	11.00 to 12.00
Railroad malleable	11.00 to 12.00
Chemical borings	7.00 to 7.50

BOSTON

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	\$5.50 to \$6.00
Scrap T rails	5.50 to 6.00
No. 2 steel	5.00 to 5.25
Breakable cast	6.00 to 6.50
Machine shop turnings	1.75 to 2.00
Bundled skeleton, long	4.25 to 4.50
Forge flashings	4.25 to 4.50
Blast furnace scrap	2.00 to 2.50
Shafting	11.50 to 12.00
Steel car axles	11.00 to 11.50
Cast iron borings, chemical	6.00 to 7.00
Store plate	6.50

Per gross ton delivered consumers' yards:	
Textile cast	\$7.50 to \$9.00
No. 1 machinery cast	7.50 to 9.00
Railroad malleable	11.00 to 11.50

NEW YORK

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	\$7.00 to \$8.50
No. 2 heavy melting steel	5.50 to 7.00
Heavy breakable cast	6.25 to 6.75
No. 1 machinery cast	7.25 to 7.75
No. 2 cast	6.50 to 7.00
Store plate	5.75 to 6.25
Steel car axles	12.50 to 13.00
No. 1 railroad wrought	7.50 to 8.00
No. 1 yard wrought, long	6.50 to 7.00
Spec. iron and steel pipe	4.50 to 5.00
Forge fire	5.50 to 6.00
Rails for rolling	9.00 to 9.50
Short shoveling turnings	2.50 to 3.00
Machine shop turnings	2.50 to 3.00
Cast borings	3.50 to 3.75
No. 1 blast furnace	2.00 to 2.50
Cast borings (chemical)	11.00 to 11.50
Unprepared yard iron and steel	4.00 to 4.50

Per gross ton, delivered local foundries:	
No. 1 machinery cast	\$10.50
No. 1 hvy. cast (cupola size)	9.50
No. 2 cast	8.00

*For direct car loading only.
†Loading on barge.

BIRMINGHAM

Per gross ton delivered consumers' yards:	
Heavy melting steel	\$9.00
Scrap steel rails	10.00
Short shoveling turnings	6.50
Steel axles	\$10.50 to \$11.00
Iron axles	10.50 to 11.00
No. 1 railroad wrought	5.50
Rails for rolling	11.00
No. 1 cast	10.50
Tramcar wheels	9.00 to 9.50
Cast iron borings, chem.	4.50 to 5.00

ST. LOUIS

Per gross ton delivered consumers' yards:	
Selected heavy steel	\$8.75 to \$9.25
No. 1 heavy melting	7.25 to 7.75
No. 2 heavy melting	6.25 to 6.75
No. 1 locomotive tires	9.50 to 10.00
Misc. stand-sec. rails	9.00 to 9.50
Railroad springs	9.00 to 9.50
Bundled sheets	9.50 to 10.00
No. 2 railroad wrought	8.00 to 8.50
No. 1 busheling	5.00 to 5.50
Cast iron borings and shoveling turnings	2.50 to 3.00
Rails for rolling	9.25 to 9.75
Machine shop turnings	2.50 to 3.00
Heavy turnings	5.50 to 6.00
Steel car axles	11.25 to 11.75
Iron car axles	13.00 to 13.50
No. 1 railroad wrought	5.50 to 6.00
Steel rails less than 3 ft.	10.75 to 11.25
Steel angle bars	9.00 to 9.50
Cast iron car wheels	7.00 to 7.50
No. 1 machinery cast	8.50 to 9.00
Railroad malleable	8.50 to 9.00
No. 1 railroad cast	8.50 to 9.00
Store plate	6.50 to 7.00
Agricult. malleable	8.50 to 9.00

DETROIT

Dealers' buying prices per gross ton:	
Heavy melting steel	\$7.00 to \$7.50
Borings and short turnings	5.00 to 5.50

ORES, FLUORSPAR, COKE, FUEL, REFRACTORIES

Lake Superior Ores

Delivered Lower Lake Ports Per Gross Ton	
Old range, Bessemer, 51.5% iron	\$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi, Bessemer, 51.50% iron	4.65
Mesabi, non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore

C.A.F. Philadelphia or Baltimore Per Unit	
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algeria	9.50c.
Iron, low phos., Swedish, average 68% iron	9.50c.
Iron, basic or foundry, Swedish, aver. 65% iron	9c.
Iron, basic or foundry, Russian, aver. 65% iron	9c.
Manganese, Caucasian, washed 52%	26c.
Manganese, African, Indian, 44-48%	21c.
Manganese, African, Indian, 49-51%	24c.
Manganese, Brazilian, 46 to 48%	20c.

Per Net Ton Unit	
Tungsten, Chinese, wolframite, duty paid, delivered*	\$17.50 to \$18.50
Tungsten, domestic scheelite, delivered†	17.00

Per Gross Ton	
Chrome, 45%, Cr ₂ O ₃ , crude, c.i.f. Atlantic Seaboard	\$17.00
Chrome, 48%, Cr ₂ O ₃ , c.i.f. Atlantic Seaboard	20.00

*Quotations nominal in absence of sales.
†Nominal; no supplies available.

Fluorspar

Per Net Ton	
Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines for all-rail shipment	\$15.50 to \$16.00
Same grade for Ohio River barge shipment for Kentucky and Illinois River landings	17.50
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines	\$15.50 to \$16.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	19.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2% silicon, f.o.b. Illinois and Kentucky mines	30.00

COKE, COAL AND FUEL OIL

Coke Per Net Ton	
Furnace, f.o.b. Connellsville	\$3.85
Prompt, f.o.b. Connellsville	\$4.00 to \$4.10
Foundry, f.o.b. Connellsville	5.10
Foundry, by-product, Chicago ovens, for delivery outside switching district	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	11.00
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	9.00

Long turnings	\$3.75 to \$4.25
No. 1 machinery cast	9.50 to 10.00
Automotive cast	10.00 to 10.50
Hydraulic comp. sheets	7.00 to 7.50
Store plate	6.25 to 6.75
New factory busheling	6.00 to 6.50
Old No. 2 busheling	4.00 to 4.50
Sheet clippings	3.50 to 4.00
Flashings	6.00 to 6.50
Low phos. plate scrap	7.50 to 8.00

CANADA

Dealers' buying prices per gross ton:	
	Toronto Montreal
Heavy melting steel	\$5.50 \$5.50
Rails scrap	6.00 4.50
Machine shop turnings	2.50 2.50
Boiler plate	4.50 4.50
Heavy axle turnings	2.50 2.50
Cast borings	3.00 3.00
Steel borings	2.00 2.00
Wrought pipe	2.50 2.50
Steel axles	4.50 4.50
Axles wrought iron	4.50 4.50
No. 1 machinery cast	7.75 8.00
Store plate	4.50 5.00
Standard car wheels	7.25 7.50
Malleable	6.75 7.00

Foundry, by-product, Cleveland, delivered	\$9.25
Foundry, Birmingham	8.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	8.00

Coal

Per Net Ton	
Mine run steam coal, f.o.b. W. Pa. mines	\$11.50 to \$12.00
Mine run coking coal f.o.b. W. Pa. mines	2.05 to 2.15
Gas coal, 4-in. f.o.b. Pa. mines	2.35 to 2.45
Mine run gas coal f.o.b. Pa. mines	2.05 to 2.15
Steam slack, f.o.b. W. Pa. mines	1.55 to 1.65
Gas slack, f.o.b. W. Pa. mines	1.90 to 2.10

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. f.o.b. Baltimore	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. del'd Chicago	
No. 3 industrial fuel oil	3.80c.
No. 5 industrial fuel oil	3.50c.

Per Gal. f.o.b. Cleveland	
No. 3 distillate	3.50c.
No. 4 industrial	3.20c.
No. 5 industrial	4.00c.

REFRACTORIES

Fire Clay Brick

Per 1000 f.o.b. Works	
High-heat intermediate Duty Brick	Duty Brick
Pennsylvania	\$45.00
Maryland	45.00
New Jersey	55.00
Ohio	45.00
Kentucky	45.00
Missouri	45.00
Illinois	45.00
Ground fire clay, per ton	7.00

Chrome Brick

Per Net Ton	
Standard size	\$45.00

Silica Brick

Per 1000 f.o.b. Works	
Pennsylvania	\$45.00
Chicago	55.00
Birmingham	55.00
Silica clay, per ton	8.00

Magnesite Brick

Per Net Ton	
Standard size, burned, f.o.b. Baltimore and Chester, Pa.	\$45.00
Unburned, f.o.b. Baltimore	55.00
Imported grain magnesite, f.o.b. Baltimore and Chester, Pa.	45.00
Domestic grain magnesite, f.o.b. Baltimore and Chester, Pa.	45.00
Domestic, f.o.b. Chewelah, Wash.	22.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	3.15c.
Structural shapes	3.15c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.90c.
Cold-finished and screw stock:	
Rounds and hexagons	3.45c.
Squares and flats	3.45c.
Hoops and bands under 1/4 in.	3.20c.
Hot-rolled annealed sheets (No. 24)	3.30c.
Galv. sheets (No. 24), 25 or more bundles	3.95c.
Hot-rolled sheets (No. 10)	2.95c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	\$3.69
Spikes, large	2.90c.
Track bolts, all sizes, per 100 count	65 per cent off list.
Machine bolts, 100 count	65 per cent off list.
Carriage bolts, 100 count	65 per cent off list.
Nuts, all styles, 100 count	65 per cent off list.
Large rivets, base per 100 lb.	\$3.50
Wire, black, soft ann'd. base per 100 lb.	\$2.70
Wire, galv. soft, base per 100 lb.	\$2.95
Common wire nails, per keg	\$2.84
Cement coated nails, per keg	\$2.84

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 9999 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.20c.
Soft steel bars	2.95c.
Cold-fin. steel bars:	
Rounds and hexagons	3.50c.
Flats and squares	3.50c.
Hot-rolled strip	3.30c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.55c.
Hot-rolled sheets (No. 10)	3.05c.
Spikes (keg lots)	3.50c.
Track bolts (keg lots)	4.65c.
Rivets, structural (keg lots)	3.65c.
Rivets, boiler (keg lots)	3.75c.
Machine bolts	60 and 5
Carriage bolts	60 and 5
Lag screws	60 and 5
Hot-pressed nuts, sq. tap. or blank	60 and 5
Hex. head cap screws	80
Cup point set screws	70 and 10
Flat head bright wood screws	37 1/2 and 10
Spring collets	50
Store bolts in full packages	70
Rd. hd. tank rivets, 7/16 in. and smaller	57 1/2
Wrought washers	\$4.50 off list
No. 8 black ann'd wire per 100 lb.	\$3.85
Com. wire nails, base per keg	3.05
Cement c'd nails, base per keg	3.05

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. All prices are f.o.b. consumers' plants within the Chicago switching district.

NEW YORK

	Base per Lb.
Plates, 1/4 in. and heavier	3.40c.
Structural shapes	3.37c.
Soft steel bars, small shapes	3.23c.
Iron bars	3.22c.
Iron bars, swed. charcoal	6.50c to 7.25c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.92c.
Flats and squares	4.42c.
Cold-rolled; strip, soft and quarter hard	3.32c.
Hoops	3.52c.
Bands	3.52c.
Hot-rolled sheets (No. 10)	3.27c.
Hot-rolled ann'd sheets (No. 24)	3.85c.
Galvanized sheets (No. 24)	4.50c.
Long term sheets (No. 24)	5.20c.
Standard tool steel	11.00c.
Wire, black annealed (No. 10)	3.25c.
Wire, galv. (No. 10)	3.85c.
Tire steel, 1 x 1/4 in. and larger	3.65c.
Open hearth spring steel	4.00c. to 10.00c.
Common wire nails, base, per keg	\$3.21
Machine bolts, cut thread:	
All diameters	70
Carriage bolts, cut thread:	
All diameters	70
Boiler tubes:	Per 100 Ft.
Lap welded, 2-in.	\$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.44c.
Bars, soft steel or iron	3.19c.
Cold-fin. rounds, shafting, screw stock	3.74c.
Hot-rolled annealed sheets (No. 24)	4.09c.
Galv. sheets (No. 24)	4.79c.
Hot-rolled sheets (No. 10)	3.29c.
Black corrug. sheets (No. 24)	4.09c.
*Galv. corrug. sheets	4.79c.
Structural rivets	3.99c.
Boiler rivets	4.09c.
Tank rivets, 7/16 in. and smaller	55
Machine and carriage bolts, lag screws, fittings up bolts, bolt ends, pivot bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts:	
1000 lb. or over	70 and 10
200 to 999 lb.	67 1/2 and 10
100 to 199 lb.	65 and 10
Less than 100 lb.	60 and 10

*No. 26 and lighter take special prices.

PHILADELPHIA

	Base per Lb.
*Plates, 1/4-in. and heavier	2.95c.
*Structural shapes	2.95c.
*Soft steel bars, small shapes, iron bars (except bands)	2.90c.
*Reinforc. steel bars, sq. twisted and deformed	2.955c.
Cold-finished steel bars	3.73c.
*Steel hoops	3.40c.
*Steel bands, No. 12 and 3/16 in., incl.	3.15c.
Spring steel	5.00c.
*Hot-rolled annealed sheets (No. 24)	3.55c.
*Galvanized sheets (No. 24)	4.25c.
*Hot-rolled annealed sheets (No. 10)	3.05c.
Diam. pat. floor plates, 1/4 in.	4.95c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.
†For 50 bundles or over.
‡For less than 2000 lb.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	3.31c.
Soft steel bars	2.95c.
Reinforc. steel bars	2.10c.
Cold-finished steel bars	3.40c.
Flat-rolled steel under 1/4 in.	3.36c.
Cold-finished strip	3.06c.
Hot-rolled annealed sheets (No. 24)	3.96c.
Galvanized sheets (No. 24)	4.61c.
Hot-rolled sheets (No. 10)	3.11c.
Hot-rolled 3/16 in. 24 to 48 in. wide sheets	3.56c.
Black ann'd wire, per 100 lb. and No. 9 galv. wire, per 100 lb.	\$2.65
Com. wire nails, base per keg	2.40

*Plus mill, size and quantity extras.
†Outside delivery 10c. less.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.15c.
New billet reforc. bars	3.25c.
Rail steel reforc. bars	3.25c.
Hoops and bands, 3/16 in. and lighter	3.45c.
Cold-finished bars	3.70c.
Hot-rolled annealed sheets (No. 24)	4.00c.
Galv. sheets (No. 24)	4.70c.
Hot-rolled sheets (No. 10)	3.30c.
Structural rivets	4.35c.
Small rivets	55 per cent off list
No. 9 ann'd wire, per 100 lb. (1000 lb. or over)	\$2.91
Com. wire nails, base per keg (1 to 24 kegs)	3.50
25 to 50 kegs	3.30
Larger quantities	3.10
Cement c'd nails, base 100-lb. keg	3.50
Chain, 1-in., per 100 lb.	8.35
Seamless steel boiler tubes, 2-in.	\$19.03
4-in.	44.96
Lap-welded steel boiler tubes, 2-in.	18.10
4-in.	42.32

BUFFALO

	Base per Lb.
Plates	3.27c.
Struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.90c.
Cold-fin. flats and sq.	3.55c.
Round and hex.	3.55c.
Cold-rolled strip steel	3.19c.
Hot-rolled annealed sheets (No. 24)	4.05c.
Heavy hot-rolled sheets, 3/16 in., 24 to 48 in. wide	3.62c.
Galv. sheets (No. 24)	4.70c.
Bands	3.42c.
Hoops	3.42c.
Hot-rolled unannealed sheets	3.17c.
Com. wire nails, base per keg	\$3.25
Black wire, base per 100 lb.	3.55c.

BOSTON

	Per Lb. Base
Beams, channels, angles, tees, zees	3.52c.
H beams and shapes	3.52c.
Plates—sheared, tank and univ. mill, 1/4 in. thick and heavier	3.53c.
Floor plates, diamond pattern	3.33c.
Bar and bar shapes (mill steel)	3.30c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.60c. to 4.60c.
Half rounds, half ovals, ovals and berels	4.55c.
Tire steel	4.55c.
Cold-finished rounds and hexagons	5.25c.
Cold-rolled strip steel	3.245c.
Cold-finished squares and flats	4.30c.
Blue annealed sheets, No. 10 gal.	3.60c.
One pass cold-rolled sheets No. 24	4.15c.
Galvanized steel sheets, No. 24 ga.	4.85c.
Lead coated sheets, No. 24 ga.	5.80c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

PACIFIC COAST

	Base per Lb.
San Francisco	
Los Angeles	
Seattle	
Plates, tank and U. M.	3.55c. 3.70c. 3.55c.
Shapes, standard	3.55c. 3.70c. 3.55c.
Soft steel bars	3.60c. 3.70c. 3.60c.
Reinforcing bars	3.50c. 3.50c. 3.50c.
Hot-rolled annealed sheets (No. 24)	4.40c. 4.45c. 4.40c.
Hot-rolled sheets (No. 10)	3.75c. 3.80c. 3.75c.
Galv. sheets (No. 24)	5.00c. 5.05c. 5.00c.
Cold finished steel:	
Rounds	5.95c. 5.95c. 4.75c.
Squares and hexagons	7.20c. 7.20c. 6.00c.
Flats	7.70c. 7.70c. 7.00c.
Common wire nails—base per keg less carload	\$3.40 \$3.25 \$3.30

All items subject to differentials for quantity.

Japan and Poland Take Boston Scrap

BOSTON, Nov. 27.—The local export scrap market continues active, with prices unchanged. A steamer left here last week for Japan, and another with 3500 tons of old rails, automobile parts and other scrap embarked for Poland. The boat for Japan took 2706 tons of old rails, etc., from here, in addition to 5000 tons loaded at Montreal and Quebec. No further exports from here are expected during the remainder of this month. Aggregate exports for the month to date are 10,425 tons. Shafting and steel car axles have been advanced 50c. a ton, but scrap prices otherwise, so far as they relate to Pennsylvania delivery, are unchanged. The local price and the market for Pittsburgh delivery on No. 1 heavy melting steel are about at parity, but in view of the steady export demand practically nothing is

moving out of the state by rail. Scrap from the Springfield, Mass., district is now moving to tidewater in round tonnages.

Pig iron demand continues to be limited to small tonnages. Some buying for first quarter delivery is expected in December, but owing to the credit situation furnace representatives will exercise caution in accepting business.

Highway Program Gets Under Way on Coast

SAN FRANCISCO, Nov. 26.—Commencement of mid-winter State highway programs is indicated by the call for bids on an increasing number of projects. Minor tonnages are generally specified, although several bridges will probably require in excess of 300 tons of structural steel.

The Santa Clara Valley Water Con-

servation District will take bids at San Jose, Cal., early in December for the construction of the Almaden and Stevens Creek dams. Approximately 500 tons of reinforcing bars will be required. At San Francisco bids are to be taken soon for the Visitacion Valley School which is estimated to cost \$256,000. A bulkhead for the Coast Guard at Oakland, Cal., will require an unannounced tonnage of sheet piling. Bids have been taken by the Bureau of Reclamation at Denver, Colo., for bridge spans for intake towers at Boulder dam and for a penstock for the power plant. Approximately 330 tons of structural steel and 170 tons of plates are involved.

Mill operations have not decreased, although the sale of finished products has been slack. Scrap for Oriental export continues active, while dealers and mills have shown little tendency to increase scrap inventories. Wholesale business for the Coast as a whole has shown slight but steady gains.

Lead Less Active as Price Steadies— Spelter Bookings Drop to 3800 Tons

Second Quarter Tin Sells in Fair Volume to Consumers—Copper Advances in Europe on Possibility of Production Control

NEW YORK, Nov. 27.—The volume of consumer inquiries for electrolytic copper has contracted somewhat, and only a general routine carlot demand is being filled by major sellers. About 11,450 tons of metal, mostly calling for February delivery, had been booked during the month up to the end of last week. There is no indication that general industrial conditions will improve to any great extent over the next few months, and consequently no heavy activity is foreseen for this metal. At present the trade here is watching with interest the events in London which supposedly represent initial moves in the plan to inaugurate worldwide production control. On rumors of a meeting in London today, the price there advanced 5 points to 6.85c. to 6.90c. a lb., c.i.f. usual Continental

base ports. Sales at this level have been of fair proportions, about equally divided between consumers and speculators. It is almost inevitable that some plan will arise to bolster the foreign market for copper. Unless some production restriction is put in force it is very likely that considerable excess metal will continue to flood the London market at distress price levels.

Tin

This commodity has been extremely stable throughout the past seven-day period. The price had its first lift this morning when several good tonnages of Straits were sold 5 points higher at 51.30c. a lb., delivered New York. Importers have enjoyed a uniformly fair consumer demand for Straits and English Refined grades during the week with first and second

quarter delivery positions specified in most cases. In London the prices likewise have a very steady aspect. Bids this morning on first call showed prompt and future standard at £228 15s. and £229 respectively, and Straits metal at Singapore slightly higher than a week ago at £230 5s. The world's apparent consumption of tin for the year ended September, 1934, was 118,700 tons, as compared with 121,100 tons in the preceding 12 months.

Lead

Major sellers are in a comparatively good position as a result of the heavy buying which developed last week following successive 5-point price reductions. Estimates of total booking during the week range from 1000 to 1200 tons, and practically all consuming lines entered December commitments. As was expected, market demand this week has slackened considerably, but current business is sufficiently heavy to overlap a good portion of contracted ore intakes. The present price of 3.50c. a lb., New York, and 3.35c., St. Louis, is considered quite firm, and at least one large seller is limiting January bookings at this price to regular customers. Around 5000 tons of metal remains to be sold for December delivery. January books were opened today and a fair consumer inquiry has appeared for that month, although heavy demand for 1935 delivery will probably not be in evidence for at least another week.

Zinc

As the ore curtailment policies of Tri-State mines seem to be as vacillating as ever, the possible price movements of spelter are difficult to foresee. However, the current level of 4.02½c. a lb., New York, and 3.67½c., East St. Louis, appears quite stable, and should consumer demand pick up to any extent a strengthening of prices would be in order. Prime Western sales last week totaled 3800 tons, at 3.67½c. to 3.72½c., mostly for first quarter delivery, as compared with 4500 tons in the preceding weekly period. The Joplin market for concentrates is considered firm at \$24 and \$25 a ton for flotation and coarse grades respectively. Production during the week returned to the usual high level of about 8000 tons, with sales totaling about 6500 tons and shipments amounting to 6200 tons. Ore stocks are estimated at over 16,000 tons, with the probability that they will soon reach 17,000 tons.

New Products Quoted

ANGLE bars and rail joints made of carbon-steel axles have been added to the list of products quoted under the steel code. In sizes adapted to rails of the more than 60 lb. per yard they are quoted at \$2.35 per 100 lb., Chicago or Aurora, Ill.

The Week's Prices. Cents Per Pound for Early Delivery

	Nov. 21	Nov. 22	Nov. 23	Nov. 24	Nov. 26	Nov. 27
Electrolytic copper, N. Y.*	8.75	8.75	8.75	8.75	8.75	8.75
Lake copper, N. Y.	9.12½	9.12½	9.12½	9.12½	9.12½	9.12½
Straits tin, Spot, New York	51.25	51.25	51.25	51.25	51.25	51.30
Zinc, East St. Louis	3.70	3.67½	3.67½	3.67½	3.67½	3.67½
Zinc, New York	4.05	4.02½	4.02½	4.02½	4.02½	4.02½
Lead, St. Louis	3.35	3.35	3.35	3.35	3.35	3.35
Lead, New York	3.50	3.50	3.50	3.50	3.50	3.50

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, virgin 99 per cent plus, 19c. to 22c. a lb., delivered.
Aluminum, remelt No. 12 (alloy), carload lots delivered, 14c. a lb., average for week.
Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 13c. a lb., New York.
Brass ingots, 85-5-5-5, 8.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	52.50c. to 53.50c.
Tin, bar	54.50c. to 55.50c.
Copper, Lake	10.25c. to 11.00c.
Copper, electrolytic	10.00c. to 10.50c.
Copper, castings	9.75c. to 10.75c.
*Copper sheets, hot-rolled	16.00c.
*High brass sheets	14.25c.
*Seamless brass tubes	16.00c.
*Seamless copper tubes	16.25c.
*Brass rods	12.75c.
Zinc, slabs	5.75c. to 6.75c.
Zinc, sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	4.37½c. to 5.37½c.
Lead, bar	5.37½c. to 6.37½c.
Lead, sheets	7.25c.
Antimony, Asiatic	14.50c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	31.00c. to 32.00c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	55.50c.
Tin, bar	57.50c.

Copper, Lake	10.00c.
Copper, electrolytic	10.00c.
Copper, castings	9.75c.
Zinc, slab	5.75c. to 6.00c.
Lead, American pig	4.50c. to 4.75c.
Lead, bar	7.75c.
Antimony, Asiatic	9.00c.
Babbitt metal, medium grade	18.50c.
Babbitt metal, high grade	59.50c.
Solder, ½ and ½	33.25c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	5.37½c.	6.12½c.
Copper, hvy. and wire	5.25c.	5.75c.
Copper, light and bottoms	4.25c.	4.75c.
Brass, heavy	2.75c.	3.37½c.
Brass, light	2.00c.	2.75c.
Hvy. machine composition	4.37½c.	4.87½c.
No. 1 yel. brass turnings	3.62½c.	4.12½c.
No. 1 red brass or compos. turnings	3.87½c.	4.37½c.
Lead, heavy	2.62½c.	3.00c.
Zinc	1.87½c.	2.25c.
Cast aluminum	9.62½c.	10.75c.
Sheet aluminum	11.00c.	12.50c.

Navy to Buy Shapes For Cruiser Wichita

WASHINGTON, Nov. 27.—The Bureau of Supplies and Accounts, Navy Department, will open bids Dec. 11 for 1200 tons of black and galvanized shapes for the cruiser Wichita, to be built at the Philadelphia navy yard. Bids also will be opened Dec. 7 for 88 tons of shapes for this cruiser.

Industry Leaders to Meet at New York

RECOMMENDATIONS for recovery will be formulated next month at the Congress of American Industry under the auspices of the National Association of Manufacturers. Fifty of the nation's leading industrialists today issued a call for manufacturers to meet in New York Dec. 5 and 6 to draft "constructive recommendations" for recovery to be presented to the convening Congress and the Administration. Donald R. Richberg, Prof. Raymond Moley, Prof. Neal Carothers, of Lehigh University, and former Governor Walter J. Kohler of Wisconsin will be among the speakers.

Detroit Scrap Mart Marking Time

DETROIT, Nov. 27.—The local trade is marking time as it awaits an upturn in steel operations. Prices are steady and unchanged at last week's level. There still is a scarcity of material in this territory because of the low rate of production in the automobile industry.

Strikes Settled in Milwaukee Plants

STRIKES of 14 weeks' duration at the plants of the Worden-Allen Co. and the Lakeside Bridge & Steel Co., Milwaukee, have been settled and operations resumed without prejudice to the open shop status heretofore existing.

In both instances the basis of settlement is nearly identical. The strikers are being restored to the payroll by seniority as rapidly as conditions permit. The union is recognized as a bargaining agent for those employees who designate, through the regional director of the National Labor Relations Board, that they wish to be represented by the union committee. Workers are to finish all old work at the rate of pay prevailing at the time the strike began, but a new rate of pay is to be worked out for new work, through negotiations between the company and an employees' bargaining committee.

An arbitration board will handle all matters except wages. The board



WYCKOFF

meets any

COLD DRAWN STEEL

requirement

Whatever is most important to you in the specification of your cold drawn steels . . . whether it be exactness to size, straightness, unvarying cross-section or guaranteed machining performance, you can always depend on the Wyckoff Organization to meet your every cold drawn steel requirement.

WYCKOFF DRAWN STEEL COMPANY

General Offices: First National Bank Bldg., Pittsburgh, Pa.

Mills at Ambridge, Pa. and Chicago, Ill.

Manufacturers of

Cold Drawn Steels

Turned and Polished Shafting Turned and Ground Shafting

will consist of one employee representative, one representative of the company, and a neutral member, acceptable to both parties, to be appointed by the calendar judge of the Milwaukee County Circuit Court.

Refractories in the Foundry Discussed

REFRACTORIES for the cupola and ladles were discussed by R. E. Aptekar, consulting engineer, Ypsilanti, Mich., at a meeting of the Detroit Foundrymen's Association on

Nov. 15. Members who took part in the discussion included A. P. McClure, Semet-Solvay Co.; Harry Dietert, United States Radiator Corp.; F. W. Walls, Eaton-Erb Foundry Co., and P. W. Uhl, Atlas Foundry Co.

In the preliminary session Glenn Coley, Detroit Edison Co., related some of his experiences during a recent visit to Europe; J. Mahon, American Car & Foundry Co., and Vaughn Reid, City Pattern Works, reported on the exhibits at the Philadelphia convention of the American Foundrymen's Association, and H. Rayner, president of the association, described the technical sessions at Philadelphia.

Fabricated Structural Steel

Awards in Good Volume—New Projects Gain

LETTINGS of 29,300 tons, the largest since the first week in June, were swelled by 16,200 tons for a Federal office building in New York and 3600 tons for a tubercular hospital in Jersey City, N. Y. New projects of 10,000 tons compare with 7625 tons last week and 13,325 tons two weeks ago. Among fresh inquiries are 1800 tons each for Public School No. 48 in Queens, N. Y., and a building for the University of Texas, Austin. Plate lettings total 1550 tons, with 4000 tons pending for a pipe line at Luce, Ore. Structural steel awards for the week follow:

NORTH ATLANTIC STATES

Revere, Mass., 950 tons, Point of Pines bridge, to Lackawanna Steel Construction Corp.

New York, 16,200 tons, Federal office building, to McClintic-Marshall Corp.

New York, 265 tons, bank building, to Bethlehem Fabricators, Inc.

New York, 220 tons, New York Central warehouse on West Thirteenth Street, to Post & McCord, erectors.

Jersey City, N. J., 3650 tons, Hudson County Tubercular Hospital, to Lehigh Structural Co.

Esperance, N. Y., 100 tons, railroad bridge, to American Bridge Co.

Long Island City, N. Y., 130 tons, Ford Instrument Co., building, to American Bridge Co.

Cambridge, N. Y., 180 tons, State highway bridge, to McClintic-Marshall Corp.

Baltimore, 110 tons, stock house for Gunther Brewing Co., to Bethlehem Fabricators, Inc.

SOUTH AND SOUTHWEST

Circleville, W. Va., 100 tons, highway bridge, to Midland Structural Steel Co.

State of Louisiana, 150 tons, Texas & Pacific overpass, to Pittsburgh-Des Moines Steel Co.

Petersburg, Va., 105 tons, hospital building, to Roanoke Iron & Bridge Co.

Blacksburg, Va., 305 tons, college building, to Southern Steel Co.

Amphill, Va., 175 tons, monorail superstructure for rayon plant of E. I. du Pont de Nemours & Co., Inc., to McClintic-Marshall Corp.

Lake Okechobee, Fla., 490 tons, Morehaven lock for United States Engineer Corps, to Virginia Bridge & Iron Co.

Sheffield, Ala., 730 tons, gate frames for Tennessee Valley Authority, to Virginia Bridge & Iron Co.

Miami, Okla., 670 tons, State highway bridge, to J. B. Klein Iron & Foundry Co.

Georgetown, S. C., 850 tons, bridge, to Nashville Bridge & Iron Co.

CENTRAL STATES

Detroit, 540 tons, sand handling and molding systems for Ford Motor Co., to Whitehead & Kales Co.

Greene County, Ill., 175 tons, truss spans, to Virginia Bridge & Iron Co.

Chicago, 185 tons, building for Rapid Transit Co., to Hanson-Elcock Foundry Co.

St. Louis, 710 tons, boiler house, to Superior Structural Steel Co.

WESTERN STATES

Long Beach, Cal., 300 tons, science building for Polytechnic High School, to Consolidated Steel Corp.

Long Beach, Cal., 200 tons, high school, to Virginia Bridge & Iron Co.

Stockton, Cal., 1000 tons, wharf shed, to Ingalls Iron Works.

Los Angeles, 150 tons, bakery addition, to Consolidated Steel Corp.

Los Angeles, 100 tons, three buildings at County farm, to unnamed bidder.

Pearl Harbor, T. H., 730 tons, seaplane hangar, to Isaacson Iron Works.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Queens, N. Y., 1800 tons, Public School No. 48; bids Nov. 30.

Pine Air, N. Y., 150 tons, State farm colony building.

SOUTH AND SOUTHWEST

Glasgow, Va., 400 tons, factory building for Blue Ridge Co.

State of Georgia, 290 tons, highway bridges.

Austin, Tex., 1500 tons, building for University of Texas.

State of Texas, 1900 tons, bridges.

State of Oklahoma, 1600 tons, highway bridges; Pawnee County, 1100 tons; Harper County, 500 tons; bids Dec. 4.

CENTRAL STATES

State of Michigan, 170 tons, highway bridges at Harrison and Hamilton.

Cast Iron Pipe

Buffalo is considering bond issue of \$950,000 for new water pipe lines, including replacement of present mains. George J. Summers, Public Works Commissioner, is in charge.

Quartermaster, United States Marine Corps, Washington, asks bids until Dec. 7 for quantity of soil pipe; also for welded steel pipe (Schedule 303).

Olney, Tex., closes bids about Jan. 3 for water pipe lines and other waterworks equipment. Joseph E. Ward, Harvey-Snyder Building, Wichita Falls, Tex., is consulting engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Dec. 7 for cast iron soil pipe and cast iron water pipe (Schedule 3796) for Eastern and Western yards.

Atwood, Ill., closes bids Dec. 10 for water pipe lines and other waterworks construction. Fund of \$50,000 has been arranged through Federal aid. Warren & Van Praag, Inc., Milliken Building, Decatur, Ill., is consulting engineer.

Department of Public Works, Bureau of Water Supply, Baltimore, asks bids until Dec. 6 for 450 tons of 6 to 20-in. and fittings.

Boone, Colo., is arranging fund of \$40,000 for main water trunk line from Ross Springs, about 1.5 miles.

Lindale, Tex., asks bids until Dec. 4 for 18,760 ft. of 2, 6 and 8-in. for water lines; also for 3000 ft. of 3/4-in. copper pipe, 50,000-gal. elevated tank and tower, pumping machinery and other equipment. Fund of \$57,000 has been arranged through Federal aid. Joseph E. Ward, Harvey-Snyder Building, Wichita Falls, Tex., is consulting engineer.

Oak Grove, Mo., plans new 16-in. for main water trunk line and smaller sizes for distribution lines. Fund of \$40,000 has been voted for this and other waterworks construction. Shockley Engineering Co., Graphic Arts Building, Kansas City, Mo., is consulting engineer.

Fond du Lac, Wis., has rejected bids received Nov. 13 for about 100 tons for water main extensions and will take new bids next spring.

Madison, Wis., has placed 350 tons for a sewage plant with James B. Clow & Sons.

Toledo, Ohio, 400 tons, building for Closure Service Co.; bids taken.

Kaufman, Ill., 175 tons, State highway bridge.

Golden, Ill., 165 tons, bridge.

State of Illinois, 375 tons: subway at Springfield, 200 tons; bridge at Madison, 175 tons.

St. Louis, 500 tons, power house for Laclede Power & Light Co.

WESTERN STATES

Fresno County, Cal., 117 tons, State bridge over Kings River; bids Dec. 12.

Plumas County, Cal., 302 tons, State bridge over Feather River at Tobis; bids Dec. 12.

Almira, Wash., 21,000 tons sheet piling, material for Grand Coulee dam, five identical bids taken.

Polk County, Ore., 100 tons, State bridge over Yamhill River; bids Dec. 6.

FABRICATED PLATE

AWARDS

New York, a substantial tonnage, of ship-building plates sold in Europe by Otto Kafka, New York steel exporters.

Cleveland, 250 tons, derrick boat for United States Engineers, to Treadway Construction Co., Buffalo.

Paducah, Ky., 1200 tons, five barges for West Kentucky Coal Co., to Marietta Mfg. Co.

Ryer, Cal., 100 tons, ferryboat repairs, to General Engineering & Dry Dock Co.

NEW PROJECTS

Boulder City, Nev., 170 tons, penstocks for power house, Specification 633-D; seven bids received.

Luce, Ore., 4000 tons, pipe line.

Chicago has opened bids on 100 tons of 6-in. Glamorgan Pipe & Foundry Co. is low bidder.

Pasadena, Cal., plans about 12,400 ft. for water system. Cost \$30,000. Financing is being arranged. C. W. Koerner is city manager.

Huntington Park, Cal., has awarded 110 tons of 8 and 12-in. to National Cast Iron Pipe Co.

San Diego, Cal., will take bids soon on 260 tons for improvements on El Cajon Avenue.

Santa Monica, Cal., will take bids Nov. 30 on 227 tons of 4 to 8-in.

Newberg, Ore., has taken bids on 304 tons with alternates on steel pipe.

Pipe Lines

Warfield Natural Gas Co., Prestonburg, Ky., plans 12-in. welded steel pipe line from natural gas fields, vicinity of Clear Creek, to points in Knott County, about 15 miles.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Dec. 7 for steel pipe and steel tubing; also for wrought iron pipe (Schedule 3805) for Eastern and Western yards.

Andalusia, Ala., closes bids Dec. 6 for gas pipe line system, including 35,948 ft. of 3/4, 1 and 1 1/4-in. galvanized steel pipe; 60,050 ft. of 2, 3, 4 and 6-in. cast iron pipe; also for 3730-cu. ft. capacity steel storage tank and 2183-cu. ft., liquid storage tank. Charles A. McKeand & Associates, City Hall Building, Andalusia, are engineers.

Jackson, La., will soon take bids for 32,000 ft. of 3/4, 1 and 2-in. galvanized pipe for water system; also for quantity of 6 and 4-in. cast iron pipe; 25,000-gal. elevated steel tank on 125-ft. steel tower, pumping plant, etc. Fund of \$44,000 has been secured through Federal aid. F. P. Joseph, Glenmora, La., is consulting engineer.

Muskegon Gas Co., Muskegon, Mich., plans natural gas steel pipe line from Muskegon to North Muskegon. Cost over \$65,000.

Troy, Ala., let contract to R. J. Reid Contracting Co., 21st Avenue and 14th Street

North, Birmingham, for municipal gas pipe system, at \$49,576. Charles A. McKeand & Associates, City Hall Building, Andalusia, Ala., are engineers.

San Diego, Cal., official tabulation of vote at general election shows bond issue of \$350,000 for 48-in. welded steel pipe line for water supply as defeated, and not approved, as reported in these columns last week. Vote failed of required two-thirds majority and project will be held in abeyance. Fred D. Pyle is city hydraulic engineer.

Newberg, Ore., is considering bids on 175 tons for water system improvements, with alternate bids on cast iron pipe.

La Mesa, Cal., has awarded 135 tons of material for La Mesa Spring Valley & Lemon Grove Irrigation District to American Concrete Pipe & Steel Co.

Readsfort, Ore., has placed 330 tons for water system improvement with the Pure Iron Culvert Co.

Railroad Equipment

Illinois Central has ordered 400 additional sets of car loaders from Evans Products Co., Detroit.

Capital Transit Co., District of Columbia, has ordered 10 street cars from J. G. Brill Co. and 10 from St. Louis Car Co. They will be constructed of Cor-Ten high-tensile steel.

National Railways of Mexico have ordered 800 standard-gage box cars, 200 standard-gage gondola cars and 200 narrow-gage box cars from Pullman Car Mfg. Corp.

B. F. Sturtevant Co. has received an order from Pullman Car & Mfg. Corp. for fans for air-conditioning 878 cars.

RAILS

Los Angeles Water and Power Department, Los Angeles, has taken bids on 690 tons of rails.

Reinforcing Steel

Awards 765 Tons—New Projects 9000 Tons

Weymouth, Mass., 165 tons, filtration plant, to Northern Steel Co.

Orange and Westchester Counties, N. Y., 275 tons, mesh for highways, to Kalman Steel Corp.

New York, 120 tons, immigration building on Ellis Island, to Carroll-McCreary Co.

New York, 250 tons, Pier 32, to Igoo Brothers.

Danville, Ill., 100 tons, building for Veterans' Administration, to an unnamed bidder.

Mora County, N. M., 106 tons, two State highway bridges, to an unnamed bidder.

NEW REINFORCING BAR PROJECTS

New York, 1300 tons, Federal office building; 500 tons for foundation sublet to George J. Atwell Co., and 800 tons for superstructure yet to be awarded.

New York, 650 tons, additional Tri-Borough bridge piers; bids Dec. 4.

Albany, N. Y., 500 tons, highway projects; general contract bids Dec. 4.

Hartsdale, Ind., 160 tons, bridge; Thomas McQueen, low bidder.

Springfield, Ill., 370 tons, water plant; Alzina Construction Co., Springfield, low bidder.

Moline, Ill., 100 tons, post office; Lundoff Bicknell Co., low bidder.

Chicago, 250 tons, slaughter house for Armour & Co.

Chicago, tonnage being estimated, theater at Ninety-fifth Street and Ashland Avenue.

Chicago, 5000 tons, outer drive. Attempts are being made to obtain State funds to complete project.

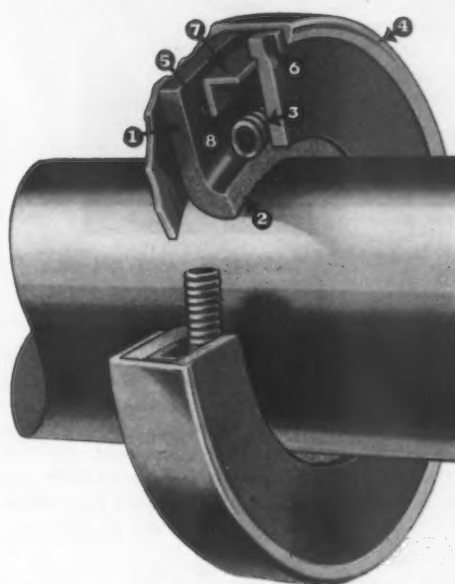
Hammond, Ind., 900 tons, filter plant; bids to be taken Dec. 16.

San Jose, Cal., 508 tons, Almaden and Stevens Creek dams for Santa Clara Valley Water Conservation District; tentative date for bids Dec. 6.

Sebastopol, Cal., 125 tons, school; bids Dec. 4.

A Good oil seal

IS ESSENTIAL TO EFFICIENT ROLL NECK BEARING PERFORMANCE



1. LEATHER PACKING MEMBER accurately formed to correct inside diameter and taper—the only element which can come in contact with the shaft.

2. WIPING LIP effectively prevents passage of lubricant or the entrance of foreign matter.

3. TENSION SPRING exerting pressure at wiping edge holds packing member on the shaft and automatically takes up any wear. Shaft contact is thus maintained even with shaft misalignment. Spring tension—scientifically developed for speeds and pressures of the individual application.

4. OUTER CUP encloses the entire assembly in one solid unit for a close press fit into housing assembly.

5. INNER SHELL carries sharp bosses which penetrate the leather of the packing member to prevent its rotation with the shaft—an exclusive feature of the "Perfect" Oil Retainer.

6. LUG on the cover washer drops into a notch in the inner shell to further prevent rotation of internal members.

7. INNER SHELL properly spaces cover washer and the flange of the packing member to permit free action of the tension spring.

8. FOOT OF INNER SHELL positively clamps flange of packing member in the outer cup.

EVERY element illustrated here is manufactured by the Chicago Rawhide Manufacturing Company in its own plant and under its own complete control.

This seal performs two important functions. It excludes mill scale, sand and water from the roll neck bearing and it prevents the leakage of oil or grease from the housing.

Specify Chicago Rawhide Seals on roll necks, pinion stands, table roll and screw down mechanisms.



THE CHICAGO RAWHIDE MANUFACTURING COMPANY

53 years manufacturing quality mechanical leather goods exclusively

1306 ELSTON AVENUE

CHICAGO, ILLINOIS

New York Philadelphia Pittsburgh Detroit Cleveland Cincinnati Boston

Ore Movement Totals 22,249,600 Tons

SHIPMENTS of Lake Superior ore by water during 1934 were 22,249,600 tons as compared with 21,623,897 tons during 1933. The shipping season closed with the despatch of two cargoes Nov. 25. The movement during November was 484,191 tons. Shipments for all ports during the past two seasons and shipments for the past ten years are listed below.

Lake Ore Shipments by Water Gross Tons

	November	Season 1934	Season 1933
Escanaba	104,200	1,543,737	1,647,980
Marquette	50,831	2,207,566	2,622,584
Ashland	21,248	2,286,766	2,400,769
Superior	135,164	6,996,206	5,835,101
Duluth	117,197	6,015,630	5,839,523
Two Harbors ...	55,551	3,199,695	3,277,941
	484,191	22,249,600	21,623,897

Water Shipments of Last 10 Years Gross Tons

1925	54,081,298	1930	46,582,982
1926	58,537,855	1931	23,467,786
1927	51,107,136	1932	3,567,985
1928	53,980,874	1933	21,623,897
1929	65,204,600	1934	22,249,600

PERSONALS

THOMAS T. WATSON, who joined the metallurgical department of the Lukens Steel Co., Coatesville, Pa., in 1931, has been appointed development and service metallurgist and will be engaged principally in service and sales work in connection with Lukens Nickel-Clad steel. Mr. Watson was born and educated in Scotland and prior to coming to this country in 1930 was identified successively with David Colville & Sons, Clyde Alloy Steel Co. and Dorman Long & Co.



THOMAS T. WATSON

HOWARD U. HERRICK, formerly president of the V & O Press Co., Hudson, N. Y., will take up his duties on Dec. 1 as vice-president of the E. W. Bliss Co., Brooklyn, N. Y.

F. A. WILLIAMS has been placed in charge of all tool design at the plant of Serval, Inc., Evansville, Ind.

J. D. BERG has been elected chairman of the board of the Dravo Corp., Pittsburgh, to fill the vacancy caused by the recent death of Ralph M. Dravo. V. B. EDWARDS has been named president, and ALEX W. DUNN has been elected executive vice-president. J. S. MILLER has been elected president of the Dravo Contracting Co., and W. K. FITCH, president of the Dravo-Doyle Co.

WALLACE V. EMERY, welding superintendent of the Harnischfeger Corp., Milwaukee, has been transferred to its Detroit office, in charge of welder sales for that district. After an association of nearly six years with the Seaman Body Corp., Milwaukee, Mr. Emery joined the Harnischfeger Corp. in 1924. Besides having charge of all welding operations he also served in a consulting and promotional capacity.

HARRY L. HORNING, president, and JOHN B. FISHER, chief engineer, Waukesha Motor Co., Waukesha, Wis., are making a six weeks' business trip to Europe. In England Mr. Horning will consider the establishment of a London office.

M. L. MURRAY, who has been identified with the wire business for the last 40 years, has been elected president and general manager of the Nickel Alloy Co., Jasper and Westmoreland streets, Philadelphia, maker of resistance wire, pure nickel and nickel alloys. The company has recently installed new equipment for wire drawing and cold rolling.

SIDNEY LANGSTON has been appointed sales representative in charge of the Cleveland district for the Ex-

Cell-O Aircraft & Tool Corp., Detroit, and will handle the complete line of Ex-Cell-O products there. For the last seven years he has been district manager at Cleveland for the Kearney & Trecker Corp. and previously was associated with the Cleveland office of the Pratt & Whitney Co.

RAYMOND J. KOCH has been elected president, to succeed the late William F. Babcock, and GEORGE J. COUPE has been chosen secretary of the Felt & Tarrant Mfg. Co., Chicago. After graduation from Armour Institute of Technology, Mr. Koch engaged in railroad engineering. Later he joined the organization of the Ilg Electric Ventilating Co. and after 10 years of service resigned in 1928 as assistant.



CHESTER H. LEHMAN, who has been appointed vice-president in charge of sales of the Blaw-Knox Co., Pittsburgh.

treasurer to accept a position with the Comptometer organization. Two years later he was elected secretary and treasurer of the company. Mr. Coupe has long been associated with the company as head of the accounting department.

H. B. ROST, for the past six years associated with Eaton Rhodes & Co., Cincinnati, will become associated with the Semet-Solvay Co. in its Cincinnati sales office. Mr. Rost, previous to his employment by Eaton Rhodes & Co., was for 11 years with the Hamilton Coke & Iron Co. in the coke and pig iron departments.

L. G. PRITZ, who has been vice-president and general manager of the Ohio Ferro Alloys Corp., Canton, Ohio, has been elected president of that company filling a vacancy that had existed for some time.

OBITUARY

WILLIAM WILKESON, of Buffalo, vice-president of the Leech Steel Corp., Rochester, N. Y., died Nov. 20, aged 47 years. He was manager of the Construction Supply Co. and president of Wilkeson-Harding, Inc.

HARVEY SHILLING, superintendent of the Clairton, Pa., blast furnaces of the Carnegie Steel Co., died suddenly on Nov. 20. He was 50 years old. A native of Ohio, he had been associated with the Carnegie Steel Co. for 20 years.

MARCUS W. SAXMAN, SR., president of the Saxman Coal & Coke Co., Latrobe, Pa., and a director of the Latrobe Electric Steel Co. and of the Conemaugh Iron Works, died after a short illness on Nov. 20. He was 66 years old.

CHARLES H. ALLYN, one of the founders and vice-president of the Madison Plow Co., Madison, Wis., died Nov. 18, aged 76 years. He was a native of Iowa, going to Madison in 1885. With Jackson Reuter, Mr. Allyn in 1910 founded the plow company, at the same time acquiring the farm implement lines of the Fuller & Johnson Co.

SOL S. SILVERSTEIN, vice-president of Silverstein & Pinsof, Inc., Chicago, dealer in scrap metal, died Nov. 20, aged 73 years. He had been a leader in the Chicago scrap metal industry for 45 years.

JOSEPH GAFF ANDREWS, secretary and treasurer of the Newport Rolling Mill Co., secretary of the Andrews Steel Co., and president of the Globe Iron Roofing & Corrugating Co., all of Newport, Ky., died suddenly on Nov. 19. Mr. Andrews, who was 57

years old, had been in failing health for several weeks.

♦ ♦ ♦
LAWRENCE G. PUCHTA, former vice-president of the Queen City Supply Co., Cincinnati, died of pneumonia on Nov. 5, aged 39 years. He became identified with the company after attending the University of Michigan for three years. Beginning at the bottom, he worked his way up to the vice-presidency and retired a year ago because of ill health.

♦ ♦ ♦
EDWARD F. LASAR, who founded the Lasar Mfg. Co., ornamental iron and bronze, 40 years ago in St. Louis, and was its head until he retired in 1925, died of pneumonia at his home in Vero Beach, Fla., on Nov. 17, aged 75 years. He had lived in Florida since he relinquished active control of the business to his son, Edward G. Lasar, president, although he continued as vice-president.

♦ ♦ ♦
REUBEN MICHENER, formerly general sales agent of the Crucible Steel Co. of America, died Oct. 26, aged 67 years. He was associated with the Crucible company and its predecessor, the Park Steel Co., continuously for



REUBEN MICHENER

a period of 45 years. At the age of 22, he entered the sales service of the Park company at Philadelphia and, following the formation of the Crucible Steel Co. of America in 1900, he was transferred to Chicago in charge of sales. From there he was transferred to the general office of the company in Pittsburgh and later to New York, serving as a sales executive during the past 20 years.

♦ ♦ ♦
HARRY BROWN, president of the McLacon Foundry Co., New Haven, Conn., and a director of the Eastern Machinery Co. and the Connecticut Foundrymen's Association, died at his home on Nov. 22. He was born in East Hampton, Conn., July 15, 1862, and early in life was associated with his father, a well known machinery manufacturer.

NON-SHRINK, OIL HARDENING TOOL STEEL TUBING



The job of making ring dies, cutting dies, bushings spacers, etc., is half done when you start with Bissett Tool Steel Tubing. There is a size carried in stock to meet every requirement up to 12" O.D. and 2" wall thickness. Larger sizes can be supplied.

It eliminates forging, does away with annealing difficulties and cuts down machining cost.

We also supply special tubing to S.A.E. 52100 and S.A.E. 4615 analysis for Ball Bearing purposes.

Manufacturers of BISCO Tungsten Carbide and Tantalum Carbide drawing dies for wire, rod and tubing.

THE BISSETT STEEL COMPANY
945 E. 67th STREET, CLEVELAND, O.

Cincinnati

Philadelphia

New British Steel Plant Being Planned

PROPOSALS are nearing finality for the establishment of a new steelworks on the northeast coast of Great Britain, designed especially to manufacture highly finished thin sheets. The interests concerned are now engaged in considering possible sites, and the works appear likely to be located at Darlington, although no definite decision has yet been reached.

The new works will involve an expenditure of approximately \$2,500,000 on buildings, machinery, and equipment. The products which it is intended to manufacture are suitable for automobile bodies, office furniture, window frames, doors, and partitions.

Asks That Labor Laws Be Kept Separate

SEPARATION of labor legislation from industrial measures dealing with fair trade practices in legislation to replace the National Industrial Recovery Act on its expiration has been recommended by the directors of the National Association of Manufacturers, acting upon the report of a special committee on future relations of Government to industry.

The board has submitted the statement of principles for legislation to industry with its recommendation for ratification at the Congress of American Industry to be held in New York Dec. 5 and 6 in conjunction with the association's annual convention.

In making its report the committee, of which James W. Hook, president of the Geometric Tool Co., New Haven, Conn., is chairman, stressed the need for cooperation to bring recovery and pledged its cooperation to the Administration.

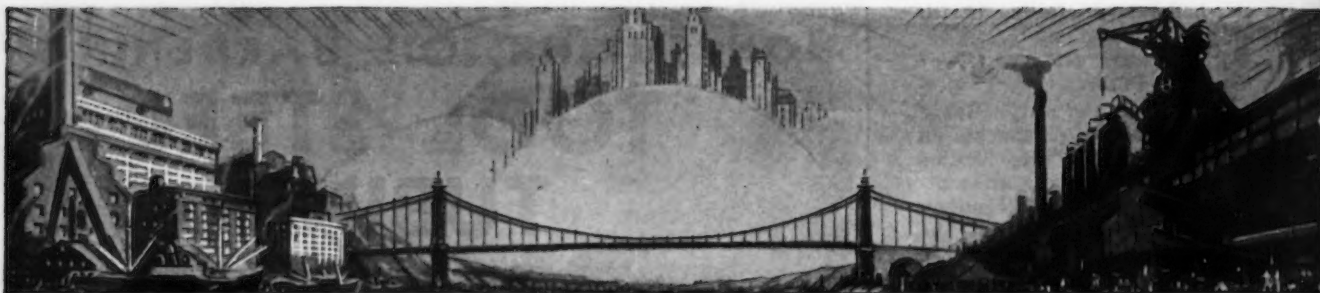
October Iron and Steel Imports Light

THE United States imported only 20,202 gross tons of iron and steel products during October, a decline of 15.2 per cent under the previous month and 56.7 per cent under those received during the corresponding month of last year. The October total represented the second smallest monthly tonnage of the current year, the lowest having been registered in August with 17,676 tons.

Compared with the preceding month, the gains and losses in individual classifications were more or less evenly balanced—15 losses against 14 increases—while in five classifications there was no trade whatever.

Pig iron imports continued downward, dropping 5608 tons and represented the outstanding decrease of the month.

The chief sources of the October imports included Belgium which accounted for 27.3 per cent of the total, supplanting the Netherlands which dropped back to seventh position, Canada with 18.6 per cent, Czechoslovakia with 17.3 per cent practically all made up of pig iron, British India with 12.5 per cent made up entirely of pig iron, and Germany accounting for 9.2 per cent.



PLANT EXPANSION AND EQUIPMENT BUYING

Interest in Machine Tool Market Is Centered on Government Awards

WITH new buying of machine tools rather restricted, interest of machine tool dealers is still centered on Washington where bids are being taken on large lists for the Army. In view of the wide variety of equipment being purchased, announcement of awards is expected to be slow.

Little activity is reported in the automotive industry, although it is now believed that quite a lot of equipment will be bought after producers

get their new models into production. Economy will be uppermost in the plans of the industry, and it is thought that new tools will be bought freely whenever possible savings in production costs can be proved.

Citroen, large French maker of automobiles, is said to have dropped its negotiations for purchases of United States machine tools. English tool dealers, however, have been canvassing the Detroit district for good used machinery.

for gasoline torches (Schedule 3774) for Philadelphia, Puget Sound, Mare Island and other yards; until Dec. 7, 825,000 lb. high tensile steel plates (Schedule 3807) for Philadelphia yard.

Grabler Mfg. Co., the Bourse, Philadelphia, manufacturer of pipe fittings and accessories, with main plant at Cleveland, has leased two-story factory at 3955-57 Elser Street, Philadelphia, about 8000 sq. ft. floor space, for new branch plant.

◀ BUFFALO DISTRICT ▶

Central School District, Keene Valley, N. Y., plans manual training department in new two-story and basement high and grade school. Fund of \$180,000 has been secured through Federal aid. C. W. Clark, State Theater Building, Cortland, N. Y., is architect.

Electric Fire Chief Stoker, Inc., Rochester, N. Y., has been organized by Ulysses G. Todd, 316 Chili Avenue, and George E. Collison, 127 Ferris Street, both Rochester, to manufacture automatic stokers and parts.

Swift Canadian Co., Ltd., Union Stock Yards, Toronto, Ont., a subsidiary of Swift & Co., Chicago, has approved plans for new four-story lard refinery at first noted place, with storage and distribution units. Cost close to \$60,000 with machinery.

Animal Trap Co. of America, Inc., Lititz, Pa., manufacturer of steel and iron animal traps, etc., plans two-story addition to branch plant at Niagara Falls, Ont., 80 x 140 ft. Cost about \$50,000 with equipment.

◀ OHIO AND INDIANA ▶

International Harvester Co. of America, 606 South Michigan Avenue, Chicago, has asked bids on general contract for one-story unit at plant at Springfield, Ohio, 65 x 400 ft. Cost over \$100,000 with equipment.

Motor Iron Parts Co., Whitehouse, Ohio, has been organized by I. W. Sprink and G. C. Lehman, Whitehouse, to manufacture automotive parts and equipment.

Department of Water, City Hall, Cincinnati, Albert Hibbs, superintendent, plans extensions and improvements in water plants and system, for which an appropriation of \$2,500,000 is now being considered. Work will include addition to pumping station at Western Hills, with new electric-operated pumping machinery, latter to cost about \$75,000 out of total of \$170,000 for this part of program; addition to filtration plant at California, Ohio, and new machinery, cost about \$1,000,000; new main pipe line to cost \$50,000 and miscellaneous work. C. A. Dykstra is city manager.

Department of Public Service, Troy, Ohio, has approved plans for addition to machine shop at municipal electric light and power plant, in connection with extensions in power department. Cost over \$60,000. Froelich & Emery Engineering Co., Second National Bank Building, Toledo, Ohio, is consulting engineer.

Material Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until Dec. 3 for one electric furnace (Circular 324); until Dec. 5, 400 self-closing gasoline strainer nozzles and 800 gasoline servicing nozzle strainers (Circular 325); until Dec. 6, rubber metal gasoline hose (Circular 317), 75 landing gear oleo plunger shaft ends, 25 landing gear oleo plunger shafts, 35 tail wheel fork and post assemblies, 15 oil temperature regulator mounting bracket assemblies, 20 oil temperature regulator air scoops, 100 gunners' back rest attachment bolts, 50 tail wheel axles, 100 bolt axle attachments, etc. (Circular 329); until Dec. 7, exhaust collector ring assemblies,

◀ WESTERN PA. DISTRICT ▶

American Steel Foundries, Pittsburgh, is considering extensions and improvements in plant at Verona, Pa., including new equipment. Cost over \$150,000 with machinery. Headquarters are at 410 North Michigan Avenue, Chicago.

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, has plans for addition to sheet glass plant at Barborton, Ohio. Cost over \$40,000 with equipment.

United States Engineer Office, Huntington, W. Va., closes bids Dec. 7 for two steel service boats, each 42 ft. long, 16 ft. wide and 3.6 ft. deep, with hand-operated derricks, shelter house, gasoline-operated pumping machinery and accessories.

◀ NORTH ATLANTIC ▶

Bureau of Yards and Docks, Washington, has secured appropriation of \$75,000 for extensions and improvements in shops and other buildings at Brooklyn Navy Yard, and will carry out work soon.

Macklin Brothers, Inc., 423 Morris Avenue, Mott Haven, New York, scrap iron and metals, plans new storage and distributing plant on Westchester Avenue, near East 172nd Street, including traveling crane, hoists, bundling equipment, loaders, etc. Cost about \$45,000 with equipment.

Sodator Mfg. & Sales Corp., Bronx, New York, has been organized by Louis H. and Harry B. Stoller, 550 Trinity Avenue, Bronx, and associates, to manufacture soda water and beverage-making machinery and parts, dispensing equipment, etc.

Commercial Woodworking Corp., 213 West Twenty-eighth Street, New York, has leased five-story and basement building at 223 West Twenty-eighth Street for plant, expanding capacity.

Propeller Corp., New York, has been organized by Joseph A. McNamara, 40 Wall Street, and associates, to manufacture refrigerating appliances and equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Dec. 4

for 43 reversible pneumatic drills, 12 wood-boring pneumatic drills, 15 pneumatic grinders, 75 pneumatic scaling hammers and one pneumatic chipping hammer (Schedule 3782) for Brooklyn, Boston, Mare Island and Puget Sound navy yards; steel plates and sheets, black and galvanized (Schedule 3814), 3176 lb. silver solder (Schedule 3770), steel shapes, black and galvanized (Schedule 3811) for Brooklyn yard; four 5-ton, 10 2-ton, 11 1½-ton, 33 1-ton, 26 ½-ton and 12 ¼-ton chain hoists (Schedule 3779) for Brooklyn, Boston, Portsmouth, Washington, Charleston and other yards; 280 lubricating guns (Schedule 3778) for Brooklyn, Puget Sound, San Diego and Mare Island yards.

General Foods Corp., 250 Park Avenue, New York, has plans for two new additions to plant of Diamond Crystal Salt Co., St. Clair, Mich., with new equipment in other parts of plant to replace old machinery. Cost over \$60,000 with equipment. Company has begun work on two grain elevators at plant of Postum Cereal Co., Battle Creek, Mich. Cost over \$150,000 with elevating, conveying, screening and other machinery.

Standard Oil Co. of New Jersey, 26 Broadway, New York, has let general contract to Spearin & Preston, Inc., 30 Church Street, for new dock at oil storage and distributing plant at Linden, N. J., with tank facilities, loaders, conveyors, etc. Cost about \$200,000 with equipment. Standard Oil Development Co., engineering department, Brunswick Avenue, Linden, is engineer.

A. C. Kohl Electroplating Co., Inc., Jersey City, N. J., has been organized by Alfred C. Kohl, care of James F. Maloney, 345 Central Avenue, representative, and associates, to operate an electroplating works.

S. W. Allen Co., 536 Mitchell Street, Orange, N. J., manufacturer of calculating machines and parts, has acquired part of neighboring plant for new factory, and will remove present works and increase capacity.

J. M. Lehmann Co., Inc., New York Avenue, Lyndhurst, N. J., manufacturer of mixing machinery and parts, has let general contract to Brown & Matthews Co., 122 East Forty-second Street, New York, for one-story addition. Cost close to \$35,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Dec. 4



ARCHITECTS: GRAHAM, ANDERSON



PHILADELPHIA'S NEW PASSENGER STATION



The new Philadelphia Station of the Pennsylvania Railroad dominates, with classic dignity, the west bank of the Schuylkill. This monumental pile, architecturally enhanced by a setting of broad plazas on three sides and a galleried two-level river drive on the east, covers an area of two city blocks and takes rank as one of the largest, if not the largest, station building in the country. Its spacious roof, designed for the landing of aircraft, is significant of the "last word" in terminal facilities. Such an undertaking, so worthily executed, is a monument of courage and enterprise.

The steel framework in the station itself and in the construction of the plazas and river drive—more than fifteen thousand tons in all—was fabricated and erected by American Bridge Company. In addition, many other thousand tons of steel in bridges, towers, and poles have been fabricated by American Bridge Company for the Pennsylvania's electrification project between New York and Washington.

For whatever need structural steel may be required, the facilities of American Bridge will be found adaptable and adequate.

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starter crankshaft support assemblies (Circular 305), tow-type target assemblies (Circular 330), aircraft octants, lot of 30 to 120 (Circular 300).

Bowens Seal Fast Corp., 226 North Pine Street, Indianapolis, manufacturer of automobile radiator compositions, etc., has let general contract to S. P. Goss, 710 Laverock Road, for two-story addition, 37 x 42 ft. Cost about \$23,000 with equipment.

James H. Drew Co., Inc., 318 Traction Building, Indianapolis, has been organized by James H. and Daniel G. Drew, to manufacture railway, light and power products, line hardware, electrical equipment, etc.

City Council, Waterloo, Ind., is considering new municipal electric light and power plant. Cost over \$85,000 with equipment. **Francis Engineering Co.**, Saginaw, Mich., is consulting engineer.

NEW ENGLAND

General Distillery Corp., Hartford, Conn., has leased building at 77-83 Homestead Avenue and will remodel for new rectifying plant. Cost over \$30,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Dec. 4 for 3984 hacksaw frames (Schedule 3777) for Boston, Puget Sound, Mare Island and other navy yards; 13,940 lb. brass boat facings (Schedule 3775) for Boston, Philadelphia, Brooklyn and other yards.

Howard Clock Products, Inc., Waltham, Mass., has been organized by Harold C. Keeman and William J. Elton, 2 Marlowe Street, Dorchester, Mass., to manufacture clock mechanisms, parts, etc.

Sinclair Refining Co., 671 Memorial Avenue, West Springfield, Mass., with headquarters at New York, will proceed with new bulk oil storage and distributing plant on Bramble Street, including main one-story building, 25 x 100 ft., pumping plant, steel tanks, etc. Cost over \$40,000 with equipment.

School Committee, Providence, R. I., plans manual training department in new three-story and basement senior high school. Cost about \$1,500,000 with equipment. Financing has been arranged through Federal aid. **I. S. Gorman, City Hall**, is architect.

Service Die Corp., Lynn, Mass., has been organized by Fred A. Burke, 16 Vine Street, Saugus, Mass., and associates, to manufacture dies, tools, etc.

SOUTH CENTRAL

J. E. Pepper Distillery, Lexington, Ky., has asked bids on general contract for multi-story addition for storage and distribution. Cost about \$170,000 with equipment. **Carl J. Kiefer, Schmidt Building, Cincinnati**, is engineer.

City Council, Decatur, Ala., will have plans drawn at once for new municipal electric light and power plant. Fund of \$350,000 has been arranged through Federal aid. **Mayor James A. Nelson** is active in project.

Tennessee Valley Authority, New Sprinkle Building, Knoxville, Tenn., has plans for new control dam on Tennessee River, near Pickwick Landing, Tenn., to develop 61 ft. high single navigation lock. Cost about \$22,000,000 with lock-operating machinery, gates and other equipment.

Kentucky Macaroni Co., Floyd Street, Louisville, manufacturer of food products, has filed plans for addition. Cost about \$25,000 with machinery.

Cincinnati, Newport & Covington Railway Co., Covington, Ky., plans addition to local car barns, with shop and repair facilities. Cost close to \$100,000 with equipment.

George E. Stag Distillery, Frankfort, Ky., has let general contract to Howell & Goin, Frankfort, for extensions and improvements in storage and distributing plant. Cost over \$60,000 with equipment.

SOUTHWEST

State Building Commission, State Capitol Building, Jefferson City, Mo., will take bids soon for new power plant at State School for Feeble-Minded, Marshall, Mo. Cost about \$125,000 with equipment. **Charles A. Haskins, Finance Building, Kansas City, Mo.**, is consulting engineer; **L. R. Bowen, 315 North Seventh Street, St. Louis**, is general supervising engineer.

Anchor Burner Co., Oklahoma City, Okla., has been organized by Henry J. Clough, 313 West Twenty-eighth Street, Oklahoma City, and R. E. Evans, Tulsa, Okla., to manufacture oil burners and oil-burning equipment.

Anheuser-Busch, Inc., 721 Pestalozzi Street, St. Louis, has let general contract to C. G. Saenger Building & Construction Co., 3450 Minnesota Avenue, for one-story addition for stock house and other operating service. Cost about \$55,000 with equipment.

Board of Education, Library Building, Kansas City, Mo., will take bids soon on general contract for new three-story and basement shop and equipment building at Twenty-second and Charlotte Streets. Cost \$120,000 with equipment. Financing has been completed through Federal aid. **Charles A. Smith, Finance Building**, is architect; **Nate W. Downes**, last noted address, is mechanical engineer.

Common Council, Avery, Tex., asks bids until Dec. 7 for pumping machinery and accessories, 50,000-gal. capacity elevated steel tank and tower, pipe lines, etc., for municipal waterworks. **D. C. Wamsley, Thompson Building, Dallas, Tex.**, is consulting engineer.

Brazos River Conservation and Reclamation District, care of State Board of Water Engineers, Austin, Tex., organized recently by authority of State Legislature, plans hydroelectric power plants on Brazos River and its tributaries, in connection with reclamation and irrigation project. Power stations will be constructed as follows: Inspiration Point, 11,000-kw. capacity; Cordova Bend, 11,000-kw.; Bee Mountain, 16,000-kw.; Possum Kingdom, 13,000-kw.; Seymour, 1500-kw.; Breckenridge, 3600-kw., and Little Kreechi, 6000-kw. Project will include transmission lines and power substations, and group of electric pumping plants. Cost \$50,000,000. Financing is being arranged through Federal aid.

SOUTH ATLANTIC

Lake Worth Engineering Co., Fifty-eighth Street, West Palm Beach, Fla., P. W. Smeaser, secretary, plans extensions and improvements in Tropical Boat & Machine Works, Riviera, Fla., including new tools, wood-working and other shop equipment. Company is also in market for marine hardware.

H. G. Juett, Ayden, N. C., is at head of project to erect one-story cold storage and refrigerating plant, 120 x 320 ft. Machinery purchases will be made soon. Cost close to \$30,000 with equipment.

City Council, Miami Beach, Fla., has authorized plans for new municipal electric light and power plant. Cost over \$100,000 with equipment. **Claude A. Renshaw, city manager**, is in charge.

Royal Appliance Co., Gastonia, N. C., has been organized by A. C. Jones and T. P. Morris, Gastonia, capital \$100,000, to manufacture mechanical appliances and equipment.

MICHIGAN DISTRICT

Grand Rapids Brewing Co., Grand Rapids, Mich., plans extensions and improvements in plant of Muskegon Brewing Co., Muskegon, Mich., recently secured at bankruptcy sale, including new brew-house and installation of equipment. Cost about \$50,000 with machinery. Company will operate as a branch plant. **G. A. Mueller, 1346 Broadway, Detroit**, is architect and engineer.

Olds Motor Works, Lansing, Mich., manufacturer of Oldsmobile automobiles, has begun expansion and improvements to double present capacity, including new tools and machinery. Cost over \$1,500,000 with equipment.

Rythometer Co., Inc., 2994 East Jefferson Avenue, Detroit, has been organized by Frederick W. Vollans, Orillia, Ont., and associates, to manufacture electrical instruments and equipment.

Holland Celery Planter Co., Holland, Mich., recently organized to manufacture agricultural machinery and parts, has work under way on one-story plant, 60 x 110 ft., and plans to begin production in December. Cost about \$23,000 with machinery. **Benjamin and Henry Poll** are heads.

Mount Clemens Tool & Gear Works, Inc., Mount Clemens, Mich., has been organized by Donald E. Prior, 11781 Wyoming Street, Detroit, and associates, to manufacture gears, tools and kindred products.

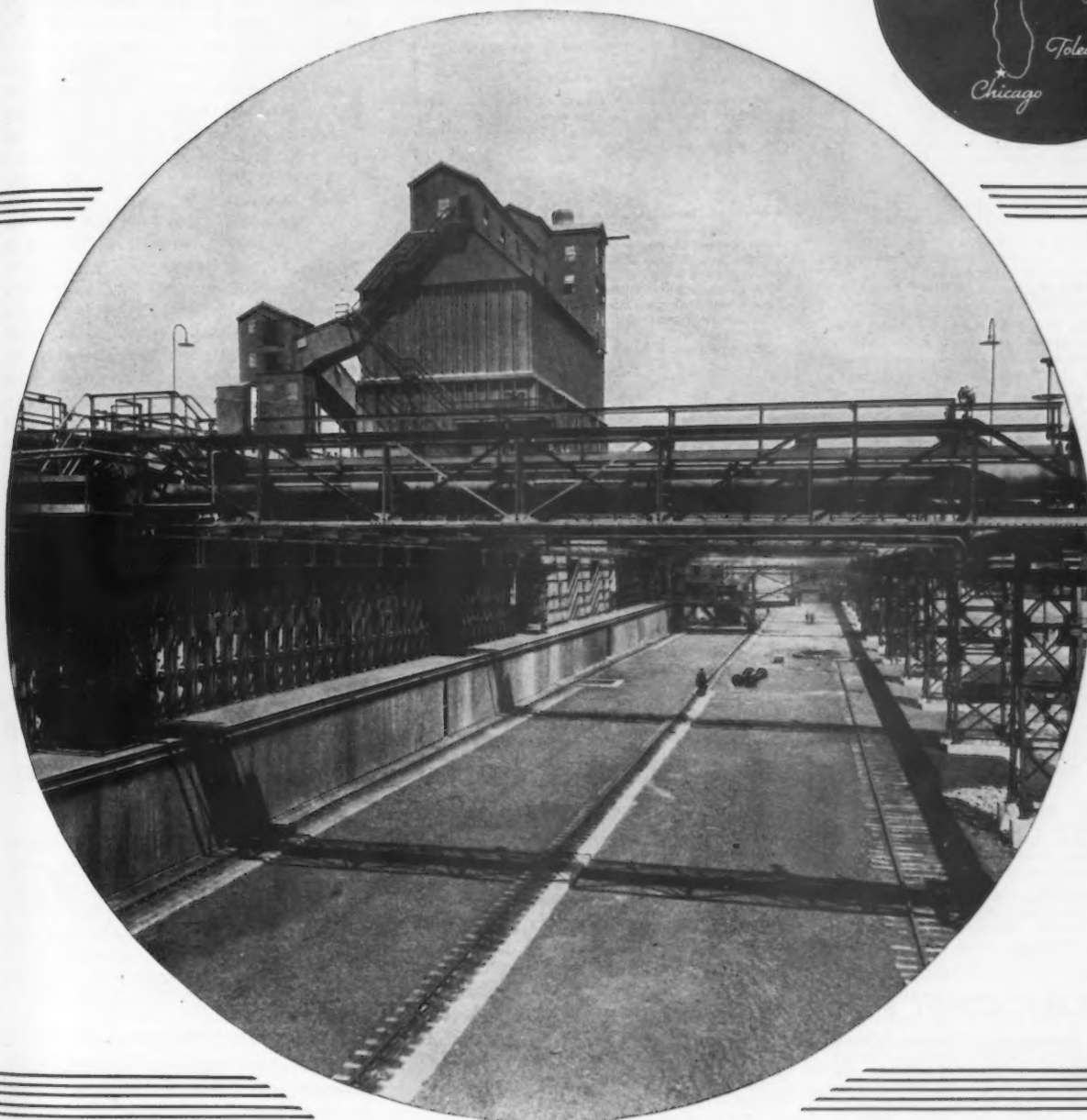
WASHINGTON DISTRICT

Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, asks bids until Dec. 10 for automobile tools, including wrenches, hammers, jacks, pliers, lubricating guns, tire irons, screw drivers, oilers, tire pumps, etc. (Circular 77).

Crown Cork & Seal Co., Eastern Avenue and Kresson Street, Highlandtown, Baltimore, has let general contract to Consolidated Engineering Co., 20 East Franklin Street, for one four-story addition, 48 x 126 ft., and two one-story, 80 x 300 ft. and 31 x 32 ft. respectively. Cost about \$100,000 with equipment. **Lucius R. White, Jr., 10 West Chase Street**, is architect.

Chief of Ordnance, United States Army, Washington, asks bids until Dec. 4 for one heavy-duty planer, two hydraulically reciprocated horizontal honing and lapping machines (Circular 21); machine tools, including one hydraulic feed surface grinding machine, one automatic sizing internal grinder machine, one universal tool and shaping machine grinder, one hob grinding machine, one drill grinding machine, two universal cylindrical grinders, five plain cylindrical grinders, 18 bench type grinders, one high-speed headstock lathe and other tools (Circular 13).

GAS is an important by-product of the manufacture of pig iron and coke. Interlake Iron Corporation supplies annually millions of cubic feet of gas to the industries and homes of its communities.



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United States Coast Guard Headquarters, Washington, asks bids until Dec. 3 for two electric starters (Adv. 3118).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Dec. 4 for hoisting and rotating equipment and spare parts (Schedule 3785), welding electrodes (Schedule 3773), contact makers, low pressure alarm, spare parts and sirens (Schedule 3786), telephone equipment and spare parts (Schedule 3754), screw drivers (Schedule 3781), 750 electric soldering irons, 35 electric flat irons, 25 electric glue pots (Schedule 3780); until Dec. 7, oil pumps (Schedule 3698), brass and copper pipe and tubing (Schedule 3789) for Eastern and Western navy yards.

◀ MIDDLE WEST ▶

Central Scientific Co., 460 East Ohio Street, Chicago, manufacturer of precision instruments, parts and equipment, has purchased at receiver's sale three-story factory at 1644-1714 Irving Park Boulevard, totaling about 104,750 sq. ft. floor space, and will improve for new plant. Present factory will be removed to new location and capacity increased.

Crescent Forge & Shovel Co., Havana, Ill., manufacturer of shovels, plows and kindred agricultural implements, plans rebuilding part of plant recently destroyed by fire. Loss over \$75,000 with equipment.

Kerstein Mfg. Co., 2222 Elston Avenue, Chicago, has been organized by D. B. and H. J. Woodworth, and H. Lehmann, to manufacture brass products.

Illinois Watch Case Co., Dundee Avenue, Elgin, Ill., and affiliated interest, Elgin American Mfg. Co., manufacturer of watch mechanisms, watch cases, etc., has let general contract to C. E. Gieritz & Son, McBride Building, for two-story and basement addition, 34 x 82 ft. Cost about \$50,000 with equipment. George E. Morris, Sherwin Building, is architect.

Dubuque Packing Co., Sixteenth and Sycamore Streets, Dubuque, Iowa, meat packer, has let general contract to W. L. Yokom, Inc., Roashek Building, for two-story addition, 100 x 120 ft. Cost about \$100,000 with equipment. H. Peter Henschel, 59 East Van Buren Street, Chicago, is architect and engineer.

Common Council, Shelton, Iowa, is arranging for bond issue of \$240,000, fund to be used for new municipal electric light and power plant, for which plans are being drawn.

Simmons Co., Kenosha, Wis., manufacturer of metal bedsteads, springs, mattresses, etc., has leased building at 947-55 South Lamar Street, Dallas, Tex., and will remodel for new branch plant.

Northwestern Distillery, Inc., Shakopee, Minn., D. B. Davis, head, is taking over former brewery of Nyssen Brewing Co., and plans to remodel for new distilling plant. Cost over \$60,000 with equipment.

Central Plating Co., 832 South Central Avenue, Chicago, has been organized by W. M. Phillips and Joseph Schulein, to operate a metal plating works.

◀ PACIFIC COAST ▶

Los Angeles Brewing Co., 1920 North Main Street, Los Angeles, has let general contract to Stanton-Reed Co., Architects' Building, for two-story addition, 75 x 151 ft., for storage and distribution. Cost about \$40,000 with equipment. L. A. Parker, Architects' Building, is architect.

City Council, Modesto, Cal., has let general contract to Ernest Green, Sycamore Avenue, for one-story municipal machine and repair shop. Cost about \$22,000 with equipment. City engineer is in charge.

Northern Pacific Railroad Co., St. Paul, Minn., is clearing site of engine and car repair shops at South Tacoma, Wash., destroyed by fire several weeks ago, and will begin rebuilding soon. Cost over \$75,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Dec. 7 for 36 water recovery system condenser panels (Schedule 3800) for Mountain View, Cal.; 10 stencil-cutting machines (Schedule 3790) for San Diego and Mare Island yards; 1320 sheet steel dust pans (Schedule 3809) for Puget Sound yard.

Minnesota Valley Canning Co., Le Sueur, Minn., is organizing subsidiary under Washington laws, to erect a new vegetable canning plant at Montesano, Wash., where site has

been acquired, to include power house and machine shop. Cost about \$150,000 with equipment.

Industrial Foundry Corp., Los Angeles, has been organized by I. O. Farris and Bryce P. Gibbs, care of H. A. I. Wolch, 639 South Spring Street, representative, to manufacture iron and other metal castings.

◀ FOREIGN ▶

Liverpool Corp., Liverpool, England, plans extensions and improvements in city airport at Speke, including two new hangars, each with capacity of nine large airplanes, with shops and reconditioning departments, new control building and other structures. Cost close to \$500,000 with equipment.

Commissariat for Heavy Industry, Soviet Russian Government, Moscow, has plans for new metallurgical plant in Khringan-Bureisk for production of pig iron, steel and rolled shapes. Cost over \$7,000,000 with equipment. Project will include power house, machine shops and other mechanical units.

Fokker Aircraft Co., Ltd., Amsterdam, Holland, Anthony Fokker, head, is acquiring property in northern part of England for branch plant for manufacture of large commercial transport planes of Douglas type, for which European rights were secured several months ago from Douglas Aircraft Co., Santa Monica, Cal. New plant will include units for parts production and assembling. Cost over \$200,000 with equipment.

Progress in Machining Practices

(Concluded from Page 34)

point in design not overlooked by the designers of broaching equipment is the provision of flexibility in the tooling. In each instance the new machines have been provided with the maximum facilities for rapidly changing cutting tools, as well as facilities for the automatic chucking and unchucking of the work.

Increased Use of Group Drives

Much constructive thinking has been stimulated by a number of articles recently published, together with supporting data, indicating that in some instances the use of individual motor drives is accompanied by a higher cost as well as an increase in power required, which goes a long way to offset the value of operating conveniences. This has encouraged the advocates of group drives, with the result that in some instances in the near future we may look to see increased use of the group-drive principle.

Automatic Inspection

The advent of a completely automatic inspecting machine dealing with the size, finish, roundness, parallelism and weight elements in the inspection of wristpins for automobiles marks the birth of a new principle in mass-production manufacturing. The exhibition of this machine at the Century of Progress Exhibition in Chicago, together with its use in the works of a well-known automobile factory, provides ample evidence of the immense possibilities for the development of this system in many shops where a really complete mass-production program is in general use.

High Pressure Die Castings

(Concluded from Page 32)

measured by improvements in product, various advantages over castings made at low pressure with high-melting temperatures. These include freedom from pinholes and blowholes, porosity being eliminated by the density; also an increase and greater uniformity in tensile strength. The metal is less liable to contamination and oxidation when melted at low temperatures, excessive heating of the dies with a possibility of die distortion is avoided and die life is prolonged. Other advantages claimed for the high pressure method include the ability to force metal into pockets in intricate dies, to produce castings to very close dimensional limits and with very thin walls, smoothness of finish and reduction in polishing costs. With porosity eliminated and density increased zinc die castings made with this machine are said to have approximately the same tensile strength as the grades of zinc base alloys from which they are produced.

The castings are produced with a white finish and some are so smooth that no buffing is required before plating, the only finishing operation being the removal of the flash. The Lester die casting machine is manufactured by the Reed-Prentice Corp., Worcester, Mass.

Germany Exceeding Tube And Rail Cartel Quotas

(Concluded from Page 39)


Unfilled orders on company books have shown a further rise. The motor road construction program in 1935 will require over 400 new steel bridges. The State Railways are building the roads and increased traffic has made the building program possible in spite of the heavy costs.

Report on Armaments Untrue

The report that the extraordinary recovery of German industry is due to huge armament orders is untrue. Even France, with a large army, estimates the total annual demand of steel for armament purposes at 50,000 tons. No German war ships are under construction except the two battle cruisers of 10,000 tons, built under the Versailles Treaty, and the steel for these ships was supplied long ago.

Even if Germany were to construct 1000 guns monthly they would require only about 1500 tons of steel, if distributed among light and heavy guns. A large program would call for only 5000 tons monthly and this is less than half of one per cent of present steel production.

MOLY



like lead in gasoline . . . a little does a lot

WHAT is probably the most remarkable of "Moly's" many qualities toward improving iron and steel becomes strikingly apparent in its use in copper-bearing ingot iron. *Less than one-tenth of one per cent* is known to allow the addition of twice as much effective copper in ferrous metals designed to resist atmospheric corrosion and that encountered in mildly acid or oil-refinery liquors.

In fact, service data show copper-Molybdenum ingot iron considerably more resistant to atmospheric corrosion than copper-bearing steels. And one oil refinery claims that in contact with corrosive oils at elevated temperatures this material has outlasted plain carbon steel by *more than three times*.

The outstanding development of modern metallurgy is unquestionably the growth in use of Molybdenum

irons and steels. In countless uses and applications it has been definitely proved that Molybdenum increases resistance to corrosion, fatigue, shock, creep, abrasion and temper embrittlement in plain or otherwise alloyed irons and steels. Making heat-treated steels easier to machine and weld—without loss of strength—is another of its characteristics. And its ultimate possibilities have not yet been approached.

"*The Moly Matrix*" is our new house organ, planned to help executives and engineers keep informed of Molybdenum's progress. A simple request puts you on our mailing list. A further request brings you either or both of these new books: "*Molybdenum in 1934*" and "*Molybdenum in Cast Iron—1934 Supplement*." And our metallurgists and experimental laboratory in Detroit offer ready assistance toward solving any alloy problems you may have. Climax Molybdenum Company, 500 Fifth Ave., New York.

CLIMAX Mo-lyb-den-um

Pearlitic Alloy Steels for High-Temperature Service

(Concluded from Page 17)

still air as the oxidizing medium. Scale was removed by an electrolytic method and results were reported in terms of weight loss in grams per square inch of original surface.

It was evident from the results that all these low-alloy steels have equally good oxidation resistance at metal temperatures up to 1000 deg. F., and they all oxidize rapidly at 1500 deg. F. though not at the same rate. At 1250 deg. F., which is about the limiting temperature in the application of the pearlitic alloy steels, there are important differences in their rates of oxidation. The 4-6 Cr-Mo steel shows the best oxidation resistance in the 1000 deg. F. to 1250 deg. F. temperature range, DM steel next best, followed by carbon, C-Mo, 4615, and MM9 in order of merit. Even though the pearlitic alloy steels are not recommended for service at a mean metal temperature of 1500 deg. F., the 4-6 Cr-Mo and DM steels nevertheless do not oxidize as fast as the other steels at this temperature. This point cannot be neglected entirely because cracking furnace tubes operating at a mean metal temperature of 1000 deg. F. might have a superficial temperature on the outside surface that would be higher than 1250 deg. F. In fact, the oxidation of a cracking furnace tube takes place in the same surface layers of metal where the superficial temperature is highest.

From the foregoing description of pearlitic alloy tube steels, it is possible to define the prospective fields of application of the several alloys, each according to its individual limitations.

MM9 steel, normalized and tempered, is intended for service at temperatures up to 1000 deg. F. wherever greatest short-time and creep strength are required, especially in high temperature steam service.

4615 steel, which has lower creep strength than MM9 steel, also qualifies for high temperature steam service up to 1000 deg. F. The 4615 would be preferred to the MM9 steel in corrosion and oxidation resistance.

C-Mo steel is used mainly for still tubes in oil refining. This alloy exhibits good creep strength and structural stability up to 1100 deg. F., although it does not resist oil corrosion and oxidation any better than plain carbon steel.

DM steel has the highest creep

strength of the group of alloys described, it is quite stable up to 1200 deg. F., and it lasts two to three times as long as carbon steel in cracking furnace tubes. There is moreover the interesting possibility that the range

Blast Furnace Fuels: Their Regional Influences

(Concluded from Page 28)

Both Pennsylvania and New York formerly had great forest reserves for charcoal, but now Pennsylvania doesn't have enough forests to timber its own coal mines. In mineral fuels for blast furnaces, Pennsylvania outranks all the states, with its raw coal, anthracite and its coking coals for bee-hive and by-product coke ovens, and its steam coals for electric power.

Ascendancy of By-Product Coke

BY-PRODUCT coke's present supremacy as the blast furnace fuel of modern practice is almost complete but it has been a harder fought battle than any of its predecessors, and it took a longer time to bring it about. Its regional influence in the location of new blast furnace plants and in the creation of new steel centers, and in maintaining old ones, has probably been greater than any of the other blast furnace fuels.

Charcoal, raw coal and anthracite were decidedly local in their regional influence and the blast furnaces using them were generally restricted to the vicinity of the supply, only less so in the case of anthracite. With bee-hive coke there were metallurgical and freight obstacles to having too great a distance between the coke ovens and the blast furnaces.

In the case of by-product coke most of the freight haul is on the coal, often by water transportation, and there is such a division of costs apportioned to gas, by-products and coke that it can be advantageously used where bee-hive coke would be prohibitive. The economic and metallurgical advantages of by-product coke over bee-hive coke have brought about the gradual extinction of the bee-hive ovens, although a few are still in operation. It is hardly possible that our present civilization will again tolerate the wholesale pollution of the atmosphere of a whole region with the

of working temperatures of DM and C-Mo steel can be extended higher by means of calorizing.

The 4-6 Cr-Mo steel is the low-alloy composition most resistant to oxidation and corrosion by petroleum products. In addition the steel is stable up to 1200 deg. F. and maintains good mechanical properties up to 1100 deg. F. The principal applications have been still tubes, heat exchanger tubes, and hot oil piping.

wasteful smoke of banks of bee-hive coke ovens.

There were many strange happenings among the blast furnace men during the long period of acquiring the technique of by-product coke. The coke oven men knew nothing about the requirements for blast furnace coke, and the furnace men could not give specifications in terms that the coke oven men could interpret. Those troubles are past, and other things being equal it is probable that the advantage of location will be with those steel plants having the lowest transportation costs on their coking coals. Thus it will be possible for Pennsylvania to hold the two-century leadership as the premier iron and steel producer, because in Pennsylvania are the greatest supplies of anthracite, or coking coals, or steam-made electricity.

In Table I are the numbers of each kind of blast furnaces built in this country arranged according to fuels and States. At one time or another blast furnaces have been built in 33 States and in the District of Columbia. At this present time, October, 1934, only 17 States have any active blast furnaces.

By-product coke is responsible for the single blast furnace in all New England; the same is true for the three coke furnaces in Minnesota, and the single furnace in Utah. The last furnaces in Wisconsin and New Jersey have been dismantled; they have iron ores but no blast furnace fuels.

For at least twenty years there have been sporadic efforts to build a merchant blast furnace at tidewater in the New York harbor area; every engineering investigation shows that, in spite of the abundant pig iron market and the direct delivery of foreign iron ores, such a scheme would not be profitable.

Blast furnace fuel is a more potent factor than iron ore in the determination of iron and steel centers. What blast furnace fuel will follow by-product coke?